

AMEC FOSTER WHEELER
BUNKER HILL CENTRAL TREATMENT PLANT UPGRADE PROJECT
Kellogg, Idaho

TRANSMITTAL FORM: Design Package 4A-IFC, 01 33 16-36

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Amec Foster Wheeler

**DESIGN BASIS / CRITERIA NARRATIVE
DESIGN PACKAGE 4A
ISSUED FOR CONSTRUCTION
CENTRAL TREATMENT PLANT – CIVIL
Bunker Hill Central Treatment Plant Upgrade Project
Kellogg, Idaho**

Prepared for:
**United States Army Corps of Engineers
Seattle District**



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ACRONYMS AND ABBREVIATIONS

Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
CIA	Central Impoundment Area
CTP	Central Treatment Plant
Government	U.S. Army Corps of Engineers, Seattle District
gpm	gallons per minute
GWCS	groundwater collection system
HDPE	high density polyethylene
O&M	operation and maintenance
PLC	programmable logic controller
SIA	Sludge Impoundment Area
SOW	Statement of Work

DESIGN BASIS / CRITERIA NARRATIVE ISSUED FOR CONSTRUCTION DESIGN PACKAGE 4A

**Bunker Hill Central Treatment Plant Upgrade Project
Kellogg, Idaho**

1.0 INTRODUCTION, PURPOSE, AND SCOPE

Amec Foster Wheeler Environment & Infrastructure, Inc., (Amec Foster Wheeler) has been contracted by the U.S. Army Corps of Engineers, Seattle District (Government), to perform design and to upgrade and expand the existing Central Treatment Plant (CTP); a groundwater collection system (GWCS) including a soil bentonite cutoff wall (SBCW) and new Sludge Impoundment Area (SIA); operation and maintenance (O&M) of the existing treatment system; and commissioning and post-construction O&M of the expanded CTP and GWCS. Amec Foster Wheeler will conduct this work under Contract Number W912DW-16-C-0012.

The purpose of this narrative is to document Design Package 4A, which covers the following components:

- CTP civil site work, including CTP demolition plans, CTP underground utilities and piping, and CTP grading plans;
- Civil discipline-specific design criteria for the project;
- Civil discipline-specific CTP design drawings and specifications; and
- Civil discipline-specific design variations for the CTP.

Design Package 4A is consistent with the Design Packaging Plan (Amec Foster Wheeler, 2017a) and the Design Quality Control Plan (Amec Foster Wheeler, 2017b). Specific requirements as defined in the Statement of Work 01 10 00 (SOW) (USACE, 2015) are summarized in Section 4. The civil preload plan for the new thickener, the new reactors, and the new filter building is included in Design Package 7.

The design specifics of the SIA and soil bentonite cutoff wall are discussed in Design Package 5 and Design Package 6, respectively. Supplemental equipment and construction sequencing needed in order to tie in and commission the supplemental treatment equipment that will be required to implement upgrades to the CTP as defined in this Design Package 4A are discussed in the Supplemental Equipment Treatment Plan/Sequencing Plan, which was submitted separately as a stand-alone document.

2.0 OVERVIEW AND REPORT ORGANIZATION

Design Package 4 is divided into five sub packages:

- Design Package 4A – CTP (Site) Civil;
- Design Package 4B – GWCS, Outfall Dissipater and Structural Concrete;
- Design Package 4C – Mechanical, Piping, Structural Steel, Architectural, and Instrumentation & Controls;
- Design Package 4D – Electrical and Heating, Ventilation, and Air Conditioning; and
- Design Package 4E – Clarifier Upgrades.

The sub packages of Design Package 4 utilize the design basis/criteria presented in Final Design Package 1. Once finalized and approved by the Government, Design Package 4 will contain the bulk of the design for the planned expansion and upgrades to the CTP. The GWCS, yard and conveyance piping outside the CTP area, and the outfall dissipater are included in Design Package 4B.

The Design Package 4A components described in Section 1 are discussed in this document as follows:

- Section 3 summarizes the CTP process upgrades/expansions, and includes a basis of design, brief overview of process design and SOW requirements.
- Section 4 summarizes the design requirements for civil/site work as well as variations from the design described in Amec Foster Wheeler's accepted proposal. Relevant documents and calculations are included in the appendices as referenced in text.
- Section 5 contains the references.

A complete discipline-specific drawing set is included as Appendix A, Design Package 4A Civil Site Work Drawings. The drawings are referenced in the applicable sections of this report. A complete specification package is included as Appendix B, Design Package 4A Civil Site Work Specifications. The specifications are referenced in the applicable sections of this report.

3.0 CENTRAL TREATMENT PLANT UPGRADES AND EXPANSION

Upgrades to and expansion of the existing central treatment plant pertaining to the site civil work are described in this section. The preliminary narrative that was provided in Design Package 1 has been expanded to include all requirements as defined in SOW Paragraphs 2.3 and 2.4, and the relevant performance standards as defined in SOW Paragraphs 3.2 through 3.8. The process description is included in Design Package 4C. This section describes yard piping for the influent system to the CTP and piping within the CTP, such as filter system piping and sludge recycle piping. Table 3-1 summarizes the scope of the upgrades and expansion of the existing CTP as defined in SOW Paragraphs 2.3 and 2.4 and the relevant requirements as defined in the Design Quality Control Plan (Amec Foster Wheeler, 2017b) and the Design Packaging Plan (Amec Foster Wheeler, 2017a), and lists the location in the text or in the other design packages where the information can be found.

Table 3-1: SOW Scope of Upgrades/Expansion of CTP

SOW Scope	SOW Requirements	Report Section
CTP Liquid Stream		
Influent System	Paragraphs 3.2, 5.2, 5.3.1	Section 3.2.2
Mine Water Pipeline Direct Feed Branch	Paragraphs 4.9, 5.5.2, 5.5.7	Sections 3.2.2.1 & 3.2.2.4
Lined Pond Influent Pipeline	Paragraphs 4.9, 5.5.2, 5.5.7	Sections 3.2.2.2 & 3.2.2.4
CIA GWCS Influent Pipeline	Paragraphs 4.9, 5.5.7	Sections 3.2.2.3, 3.2.2.4 and Design Package 4B
Reactors B1 & B2 (Neutralization and Oxidation)	Paragraphs 3.2, 5.2, 5.3.2	Section 3.2.3 and Design Packages 4B & 4C
Thickener	Paragraphs 3.2, 3.7, 5.2, 5.3.3	Sections 3.2.4, 3.2.5 and Design Packages 4B (foundation design) & 4C
Filter System	Paragraphs 3.2, 3.3, 5.2, 5.3.4	Section 3.2.6 and Design Packages 4B (foundation design) & 4C
Filter Feed Pipeline	Paragraphs 1.5, 4.9, 5.5.7	Section 3.2.6 and Design Package 4C
Dirty Backwash Return Pipeline	Paragraphs 4.9, 5.5.7	Section 3.2.6 and Design Package 4C
CTP Effluent Pipeline	Paragraphs 4.9, 5.5.7	Section 3.2.6 and Design Package 4B (outfall dissipater)
Lime System	Paragraphs 3.1, 3.2, 5.3, 5.3.6	Design Package 4C
Lime Slurry Feed Loops	Paragraphs 4.9, 5.3.6, 5.5.2, 5.5.7	Design Package 4C
Reactor A (Recycled Sludge Conditioning)	Paragraphs 3.2, 5.2, 5.3.7	Design Package 4C
Polymer System	Paragraphs 3.2, 5.2, 5.3.8	Design Package 4C

SOW Scope	SOW Requirements	Report Section
Plant Water	Paragraphs 3.2, 5.3.9	Sections 3.2.7 & Design Package 4C
Process Air	Air barrier quality control plan Paragraphs 3.1 3.2, 5.2, 5.3.10	Design Package 4C
CTP Drain System	Paragraphs 3.2, 5.2, 5.3.11	Design Packages 4B & 4C
Automatic Monitoring and Sampling Systems	Paragraphs 3.2, 5.2, 5.3.12	Design Package 4C
CTP Solid Stream		
Sludge Recycling	Paragraphs 3.7, 5.4.1, 5.4.2	Design Package 4C
Sludge Recycle Piping	Paragraphs 1.5, 4.9, 5.5.2, 5.5.7	Design Package 4C
Sludge Wasting	Paragraphs 3.7, 5.4.1, 5.4.3	Design Package 4B & 4C
Sludge Monitoring and Sampling	Paragraphs 5.4.2, 5.4.3	Design Package 4C

Abbreviations:

CIA = Central Impoundment Area

CTP = Central Treatment Plant

GWCS = groundwater collection system

SOW = Statement of Work

3.1 BASIS OF DESIGN

This section provides brief updates to the basis of design for the planned upgrades and expansion of the CTP, as necessary. The basis of design was provided in Design Package 1. The Process Design Criteria and Verification Plan is included in Appendix C. Design flows for the CTP influent and the filtration system have not changed. No updates to the basis of design affect the CTP site civil work.

3.2 PROCESS DESIGN

This section describes the various systems/unit operations that will be part of the upgraded CTP and should be reviewed in conjunction with the Design Criteria and Verification Plan (Appendix C). References to some applicable civil drawings are made in this section to support general discussion of the process. Documents and calculations required for the expansion/upgrades to the CTP summarized here are also described in Section 4. The process description for each new major component added/modified as part of the CTP improvements and the process control narrative are included in Design Package 4C.

3.2.1 General Equipment Sizing Approach

The equipment sizing and process design information presented throughout Section 3.2 is consistent with Design Package 1 and meets the requirements set forth in the SOW. Two scenarios were considered for equipment sizing: 1) base flow/strength conditions and 2) design

flow conditions. Additional information on equipment sizing is included in Design Package 4C for each component of the upgraded/expanded CTP.

3.2.2 Influent System

Influent will consist of gravity and pumped water from the Kellogg Tunnel that, in turn, gravity-feeds to the CTP, pumped groundwater from the GWCS, pumped Lined Pond water and gravity fed return water from the new SIA. There will be a total of five influent pipelines: the mine water direct feed line, the pipeline from the Lined Pond to the CTP, the two force mains from the extraction wells of the GWCS, and a return line from the new SIA. Design Package 4A covers the influent pipelines within the CTP yard area, including the mine water pipeline direct feed and the Lined Pond influent pipeline, and connection points within the CTP yard area for the GWCS pipes and the SIA return line. The pipelines outside the CTP area are included in Design Package 4B including the GWCS collection system and force main.

3.2.2.1 Mine Water Pipeline Direct Feed Branch

The existing mine water direct feed line is a 20-inch high density polyethylene (HDPE) pipeline that currently discharges to the existing aeration basin. The current discharge end of the feed line will be demolished and replaced with new piping that will discharge to Reactors B1 and B2. Drawing C-420 shows the new mine water direct feed line tie-in. The final aboveground piping is included in Design Package 4C. The mine water direct feed line will continue to provide flow by gravity. The existing valving will be used to direct mine water direct feed to the Lined Pond during shutdown of the CTP.

3.2.2.2 Lined Pond Influent Pipeline

The existing pipeline from the Lined Pond to the CTP is a 24-inch HDPE pipeline that currently discharges to the existing aeration basin. The current discharge end of the feed line will be demolished and replaced with new piping that will discharge to Reactors B1 and B2. The tie-in for the Lined Pond pipeline is included in the Supplemental Equipment Treatment Plan/Sequencing Plan and the remainder of the underground Lined Pond tie-in to Reactors B1 and B2 are shown on Drawing C-420. The aboveground piping design is included in Design Package 4C. Lined Pond water will be pumped using the existing Lined Pond pump station, which includes three pumps. A new level sensor and level controller will be installed in the Lined Pond to control the existing Lined Pond pump influent to the CTP.

3.2.2.3 Central Impoundment Area Groundwater Collection System Influent Pipeline

The GWCS force mains will be new 14-inch HDPE pipes that will run from the extraction wells to Reactors B1 and B2. The GWCS force mains will be fed using new well pumps. For potential

future CTP expansion, stub-outs will be provided for above-grade piping. Additional design details for the GWCS force mains are provided in Design Package 4B. The GWCS parallel force mains will have actuators to allow for isolation of either influent line. Piping will be provided to direct flow from the CTP to the Lined Pond, as shown on Drawing C-420.

3.2.2.4 Influent System Monitoring, Maintenance, and Control Strategy

Flow meters will be installed on influent pipelines as required by SOW Paragraph 5.3.12. Sampling valves for the collection of grab samples will be provided for each of the five influent pipelines. The GWCS force mains and extensions of both the existing Lined Pond and direct feed lines will be designed for pigging and/or cleanout by hydro-jetting. The new GWCS force main will include pig launching stations, which have been designed per specifications provided in SOW Paragraph 4.6.4. The existing pig launching station on the mine water direct feed line will continue to be used. Means to capture these pigs and to control associated hydraulic surge and remove waste material will be provided. The existing Lined Pond line will be modified so that it can be hydro-jetted. Design of the return line from the new SIA will allow for hydro-jetting of the line.

The old mine water direct feed pipeline will remain in service and undisturbed.

The upgraded CTP will be designed and configured to treat a design flow of 8,000 gallons per minute (gpm) (5,500 gpm of mine water and 2,500 gpm of groundwater), plus applicable recycle flows. Excess mine water flow beyond 5,500 gpm will be stored in the mine and is not included in the scope of work for Amec Foster Wheeler.

The Lined Pond will also be used to store water when the total combined flow to the CTP is less than 1,800 gpm, at which point it may become necessary to operate the CTP on a campaign basis due to the flow requirements for filter backwash water. An influent flow of less than 1,800 gpm to CTP is not expected with the GWCS in operation.

Under base flow conditions, all mine water and groundwater would flow to the CTP directly (except for the old mine water flows, which flow to the Lined Pond). Under base flow conditions, the Lined Pond would be operated to provide maximum live storage capacity to allow for emergency shutdown of the CTP for repair or maintenance.

Mine water direct feed, Lined Pond, GWCS, and SIA return influent streams will discharge to Reactor B1, with piping/valving provided to divert all flows to Reactor B2 in the event that Reactor B1 is out of service, as described in more detail in Design Package 4C.

3.2.3 Reactors – Neutralization, Oxidation, and Precipitation

Three tanks will be used to combine lime slurry and recirculated sludge with the influent feed water and provide mixing and residence time for the neutralization, oxidation, and metals precipitation reactions to occur as discussed in more detail in Design Package 4C. The preload plan for the reactors is included in Design Package 7. Structural concrete is included in Design Package 4B. The mechanical design of the reactors, including structural steel and equipment, is included in Design Package 4C.

3.2.4 Existing Clarifier

The existing 236-foot-diameter clarifier will continue to operate as a clarifier and provide settling of solids with production of a low-density sludge that will be pumped to a separate sludge thickener (described in Section 3.2.5) and an overflow that will discharge to the filter feed tank. The existing clarifier will be evaluated in accordance with SOW Paragraph 5.3.3 to assess the sizing and required upgrades for the new function of the feed well, the effluent launder, support bridge, feed pipeline, and supports. These upgrades will be described in Design Package 4E. Clarifier overflow will gravity flow to the filter feed tank through the existing launder and drop box, and a new clarifier effluent launder box and associated new pipeline will be provided to meet the design flow.

3.2.5 Sludge Thickener

The existing clarifier underflow will be pumped to the thickener feed tank and then to the 105-foot-diameter sludge thickener. Thickener overflow will combine with Reactor B1 and B2 overflow and dirty filter backwash in the overflow drop box leading to the clarifier feed well.

Excess sludge from the sludge thickener will be pumped from the cone of the sludge thickener in two 3-inch HDPE underground pipes to the Sludge Pond on top of the Central Impoundment Area until it reaches maximum capacity and thereafter to the new SIA. Sludge wasting will be accomplished using two new variable-frequency-drive controlled pumps, each with a nominal and maximum capacity of 75 and 150 gpm, respectively. Each pump will be connected to its own discharge pipeline to allow one pump to be in operation while the other remains on standby or is shut down for maintenance. Sludge generation rates under design flow/strength conditions are not sufficient to allow for continuous pumping of waste sludge due to the limitations of minimum practical pipeline sizing and minimum velocities needed to prevent settling and line plugging. Excess sludge will be pumped from the sludge thickener through the pipeline to the new SIA and then flushed with plant water at the end of each cycle. Additional information, including details associated with the sludge wasting pumps, is included in Design Package 4C.

3.2.6 Filtration System and Effluent System

The clarifier overflow will discharge to a filter feed tank through 24-inch underground HDPE pipes; overflow will then be pumped through seven 12-foot-diameter multimedia pressure filters for removal of suspended solids. The filter system will have to operate at a minimum flow of about 1,800 gpm or greater in order to have sufficient feed flow to generate backwash water. In the unlikely scenario the combined flow of mine water and groundwater is less than 1,800 gpm, it will be necessary to operate the CTP on a campaign basis using the Lined Pond for storage.

Effluent will be pumped through the filter system, then through a new effluent discharge pipeline and outfall dissipater to the South Fork of the Coeur d' Alene River. The design discharge flow from the filter building is 8,000 gpm, and discharge will be through a 20-inch HDPE pipeline. Design of the effluent outfall dissipater is discussed in Design Package 4B. Discharge to the effluent outfall dissipater will be accomplished using the filter feed pumps.

3.2.7 City Water System

City water will be used for the following:

- Lime slaking and dilution,
- Filling the plant water tank during start-up,
- Polymer makeup,
- Pump seal water,
- Safety shower and eyewash water, and
- Frost free washdown hose bibs.

Safety shower and eyewash water will be city water that has been heated in a tempered water tank. City water will be pumped through the three safety shower eye wash stations using two new variable speed pressure-controlled pumps with a return loop to the water heater.

Piping will be provided as a backup to allow for substitution of city water with plant water when city water is not available. The CTP's city water system will be isolated from the distribution system via a reduced pressure detector assembly (backflow preventer) located adjacent to the main gate. A new 10-inch HDPE firewater loop is being installed downstream of the backflow preventer, as shown on Drawing C-420.

3.3 GENERAL LAYOUT

The site layout is limited by the distance from the access road on the north side of the existing control building to the maintenance building. A single way road is provided, which forms a loop

for vehicles returning to Wildcat Way. The minimum road clearance is 20 feet, and it is located between the existing maintenance building and the new thickener. The site accessibility has been checked with simulation software, and the vehicle path is shown on Sheet C-001, CTP Site Layout. The location of the future reactors and filter building are shown on Drawing C-001.

4.0 DESIGN REQUIREMENTS

4.1 CIVIL/SITE WORK

Civil site work includes site layout, site demolition, site preloading, site grading, stormwater management, yard buried and overland piping, and fencing. Preloading is described in Design Package 7.

4.1.1 Design Criteria

See Civil Design Criteria DC-P-001 (Appendix D). Table 4-1 identifies Design Package 4A deliverable requirements.

Table 4-1: Design Package 4 Civil Requirements

Requirements	Source	Document	Comments
Specifications	SOW Paragraph 4.4.6	194043-700-DD10-SPC-002, revision 0, CTP Civil Specifications, Appendix B	NA
Erosion Control Measures Analyses – CTP	Design Quality Control Plan	Described in Section 4.1.2.1	NA
Demolition, Decommissioning, and Salvage Plan	Design Quality Control Plan	Described in Section 4.1.2.2; for demolition, see Sheets C-010 and C-011. The Demolition, Decommissioning, and Salvage Plan is included in Appendix F.	NA
Grading and Permanent Erosion Control	Design Quality Control Plan	Sheets C-321, C-330, C-331, and C-332	NA
Civil 2D Package	NA	Civil design sheets	NA
Overall Civil Site Plan	Design Quality Control Plan	Sheets C-001, C-002, and C-420	NA

Abbreviations:

CTP = Central Treatment Plan

NA = not applicable

SOW = Statement of Work

4.1.2 Design Solutions

4.1.2.1 Erosion Control Measures Analyses

The 2-year 24-hour rainfall is 1.85 inches (NOAA, 1973). Rainfall distribution is Type II. The catchment area is 35,000 square yards, including the CTP area and part of the adjacent neighboring property (Drawing C-321). Site cover is mainly silt gravel with sand, and silty sand with gravel above gravel. The site is classified as A/B hydrologic soil group. The 2-year storm event, 24-hour surface runoff volume is approximately 550 cubic yards.

During construction, the lower area in the southwest corner of the CTP yard (below the 2,274-foot contour line) will be used as a temporary detention pond. It can detain approximately

350 cubic yards of water. The temporary pond area cannot contain the total surface runoff of a 2-year 24-hour rainfall; the surface runoff water will be pumped to the existing thickener during and after rainfall. The pump capacity shall not be less than 100 gpm when the temporary pond reaches 2,274 feet elevation.

4.1.2.2 Demolition, Decommissioning, and Salvage Plan

The demolition, decommissioning, and salvage will be directed by two plans and DP4A Drawings C-010 and C-011. The Demolition Subcontractor will prepare a Demolition Plan consistent with Specification 02 41 00.04 that details their salvage, demolition, and removal procedures as a stand-alone plan. This plan will contain the subcontractor's approach as it relates to the specification requirements, environmental, PPE assignment, monitoring, removal/abatement, handling/storage, disposal, and other pertinent requirements. The Government will have an opportunity to review this plan and it will be documented in the Submittal Register.

A second demolition plan (Demolition Decommissioning and Salvage Plan, GeoTek, revised May 2018) related to solid and demolition waste management consistent with Specification 01 79 19 has been prepared and is included as Appendix F. Equipment inside existing structures and buildings will be salvaged or relocated to the extent practical as described in both plans.

A list of structures/buildings to be demolished, demolition details, and the key sequence are shown on Sheet C-010. The Supplemental Equipment Treatment Plan/Sequencing Plan describes construction and demolition sequencing in more detail. Removal and abandonment in place of buried pipes are shown on Sheets C-420, C-424, C-425, C-426, and C-427.

To ensure the stability of the existing maintenance building during demolition of the Polishing Pond, an early activity supporting demolition will remove sludge in the Polishing Pond. Quarry spalls of 4–8 inches will be placed into the pond beside the pond wall near the maintenance building (see Sheet C-011, Details B3 and B5). The pond wall will be demolished to pond bottom. A separate work plan for dredging the Polishing Pond and demolishing the polishing pond will be submitted to the Government or will be included as part of the Demolition Subcontractor's Demolition Plan.

Demolition, removal, and abandonment of existing utilities will be coordinated with utility providers, site personnel, the government, and contractors.

4.1.2.3 Utility

The CTP civil yard piping Sheets C-420 and C-424 through C-427 are mainly based on the process and instrumentation diagrams included in Design Package 4C. Fire water supply complies with requirements of City of Kellogg (ICC, 2015).

4.1.3 Deliverables

Design Package 4A deliverables for the civil work related to the CTP are listed in Table 4-2.

Table 4-2: Design Package 4A CTP Civil Deliverables

Sheet ID/Document Number	Document Name
C-001	CTP SITE LAYOUT
C-002	CTP EXISTING SITE LAYOUT
C-010	CTP DEMOLITION PLAN
C-011	CTP DEMOLITION SECTIONS AND DETAILS
C-321	CTP EROSION AND SEDIMENT CONTROL PLAN
C-330	CTP SITE FINAL GRADING AND SURFACE DRAINAGE PLAN
C-331	FINAL GRADING SECTIONS AND DETAILS - 1
C-332	FINAL GRADING SECTIONS AND DETAILS - 2
C-333	CTP SITE FENCE DETAILS
C-420	CTP BURIED AND OVERLAND UTILITIES OVERALL PLAN
C-424	CTP BURIED AND OVERLAND UTILITIES PLAN - 1
C-425	CTP BURIED AND OVERLAND UTILITIES PLAN - 2
C-426	CTP BURIED AND OVERLAND UTILITIES PLAN - 3
C-427	CTP BURIED AND OVERLAND UTILITIES PLAN - 4
C-430	CTP BURIED AND OVERLAND UTILITIES SECTIONS AND DETAILS - 1
C-431	CTP BURIED AND OVERLAND UTILITIES SECTIONS AND DETAILS - 2
C-432	CTP BURIED AND OVERLAND UTILITIES SECTIONS AND DETAILS - 3
C-433	CTP BURIED AND OVERLAND UTILITIES SECTIONS AND DETAILS - 4
194043-700-DD10-DSC-001	CIVIL DESIGN CRITERIA
DC-P-001	DESIGN CRITERIA AND VERIFICATION PLAN
02 41 00.04	DEMOLITION
31 00 00.04	EARTHWORK
31 32 11.04	SOIL SURFACE EROSION CONTROL
32 31 13.04	CHAIN LINK FENCES AND GATES
32 32 23.04	SEGMENTAL CONCRETE BLOCK RETAINING WALL
33 11 00.04	WATER UTILITY DISTRIBUTION PIPING
33 40 00.04	STORM DRAINAGE UTILITIES
33 46 13.04	FOUNDATION DRAINAGE SYSTEM

Abbreviations:

CTP = Central Treatment Plan

4.1.4 Design and Code Checklists

Supporting design and documentation has been developed and is included as Appendix E.

4.2 DESIGN VARIATIONS

Table 4-3 provides details of design variations. Unless indicated otherwise, variations are technically equivalent or better (i.e., of no lesser value to the Government) and in compliance with SOW criteria, at no cost to the Government, and no additive or deductive modifications of the contract are requested. Design variations that were submitted with Design Package 1 and approved by the Government are not included in Table 4-3.

Table 4-3: Design Variations

#	Design Variation	Relevant SOW criteria/ Performance Standard/s	Associated Technical Considerations	Original Design Proposal	Proposed Design Variation	Evaluation of the Design Variation
1	DRAWING NUMBERING SYSTEM	Drawings (SOW 01 33 16 Paragraph 3.7.1)	Submit drawings complete with contract requirements.	Design documents shall be in compliance with the latest version of the A/E/C CADD Standard.	Amec Foster Wheeler uses an internal drawing numbering system that is embedded in the model used to generate the CTP drawings. We propose to use our numbering system consistently across all drawing numbers. Sheet identification will be consistent with the A/E/C CADD Standard. A copy of the Amec Foster Wheeler numbering convention is available upon request.	No additive or deductive modifications are requested, and no cost impacts will be realized as a result of this variation from the accepted Amec Foster Wheeler proposal. Accepted with no exceptions per DP4A USACE Comment 7346384.
2	SLUDGE PIPING DELIVERY ALIGNMENT CTP TO SIA	Provide one or more sludge delivery lines from the sludge wasting pumps to the new impoundment. (SOW Paragraph 6.4).	Contractor is to continue filling existing sludge impoundment until such time that the existing cell is full. The existing impound has approximately 29,000 yards available capacity. (SOW Part 5.4.3). Existing sludge delivery line to the impoundment is 10" diameter. Sludge volumes from HDS plant operations will not result in sufficient volumes produced to maintain required flow velocity.	The original design proposal called for the new sludge lines from the CTP to follow the existing 10" pipeline up the CIA access roadway.	The length of the proposed delivery line (via the access roadway) produced excessive amounts of backpressure on the pumps and would have required upsizing equipment and piping to overcome the head losses. The route was modified to follow the GWCS and effluent pipelines to the CIA. The pipe to the existing impound is a single branch line from the twin delivery pipes.	The proposed design variation will allow us to continue to meet the relevant performance standard while being technically equivalent to what was initially proposed, as we will be able to more efficiently pump sludge to the impoundment. No additive or deductive modifications are requested, and no cost impacts will be realized as a result of this variation from the accepted Amec Foster Wheeler proposal. Accepted with no exceptions per DP4A USACE Comment 7346384.
3	FILTER BUILDING LOADING DOCK AND BOLLARDS	Provide a loading dock on the east building wall of the Filter Building. Bollards shall be placed on the east side of the Filter Building Loading Dock. (SOW Paragraph 5.5.2)	The east side of the filter building is inaccessible because of the design to include a new sludge thickener with access walkway.	The original design proposal shows a loading dock/ramp to the south side of the new Filter Building. The proposed design accounted for placement of a new thickener to the east of the new Filter Building.	We propose to keep the design consistent with our proposal and to provide a loading ramp to the south of the Filter Building. Bollards will be placed within approximately 1 foot of the Filter Building door to prevent errant backing strikes hitting the door frame. The loading ramp will be designed in accordance with SOW Part 5.5.2 and will provide delivery access by a WB-40 articulated truck and trailer. The ramp will allow access by a forklift and easier movement of heavy equipment to and from the new Filter Building. The future filter building, thickener, and reactors are shown on C-001 to display spacing and turn radius available.	The proposed design variation will allow us to continue to meet the relevant SOW requirements while being technically equivalent to what is required by the SOW. No additive or deductive modifications are requested, and no cost impacts will be realized as a result of this variation from the SOW. Accepted with no exceptions per DP4A USACE Comment 7346384.

#	Design Variation	Relevant SOW criteria/ Performance Standard/s	Associated Technical Considerations	Original Design Proposal	Proposed Design Variation	Evaluation of the Design Variation
4	REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA)	The CTP site shall be isolated from the distribution system via an RPBA adjacent to the main gate. <i>(SOW Paragraph 5.5.9)</i>	<p>The SOW and proof of concept drawing showed a new combined 6-inch water service connection for potable and fire water use. Based on fire flow calculations, the new water service connection for fire water should be a minimum of 8 inches.</p> <p>The RPBA has an open port for discharging water, and needs to be installed above ground and higher than the 100-year flood elevation to prevent cross-contamination.</p> <p>There is not sufficient space for aboveground installation of the RPBA adjacent to the front gate.</p>	A new 8-inch combined potable and fire water service connection with an unspecified backflow preventer.	<p>From discussions with Central Shoshone County Water District, the existing potable service connection should remain for potable water use and a new separate water connection installed for fire water use.</p> <p>There is an existing backflow preventer at each existing connection to the City water system. The new potable water connection for the filter building is proposed to be an extension of the existing potable water line after the backflow preventer in the pump house. As agreed to by Water District, no potable water backflow preventer needs to be added to the existing service connection, and a double check valve backflow assembly will be installed on the fire water service connection.</p>	<p>The proposed design variation will allow us to continue to meet the relevant SOW requirements while being technically equivalent to what is required by the SOW.</p> <p>No additive or deductive modifications are requested, and no cost impacts will be realized as a result of this variation from the SOW.</p>

Abbreviations:
A/E/C = Architecture, Engineering, and Construction
CADD = computer-aided drafting and design
CIA = Central Impoundment Area
CTP = Central Treatment Plant
GWCS = groundwater collection system
HDS = high density sludge
RPBA = reduced pressure backflow assembly
SOW = Statement of Work

5.0 REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2017a, Design Packaging Plan, February 17.

Amec Foster Wheeler, 2017b, Design Quality Control Plan Revision 1, Bunker Hill Central Treatment Plant Upgrade Project, Kellogg, Idaho, March 31.

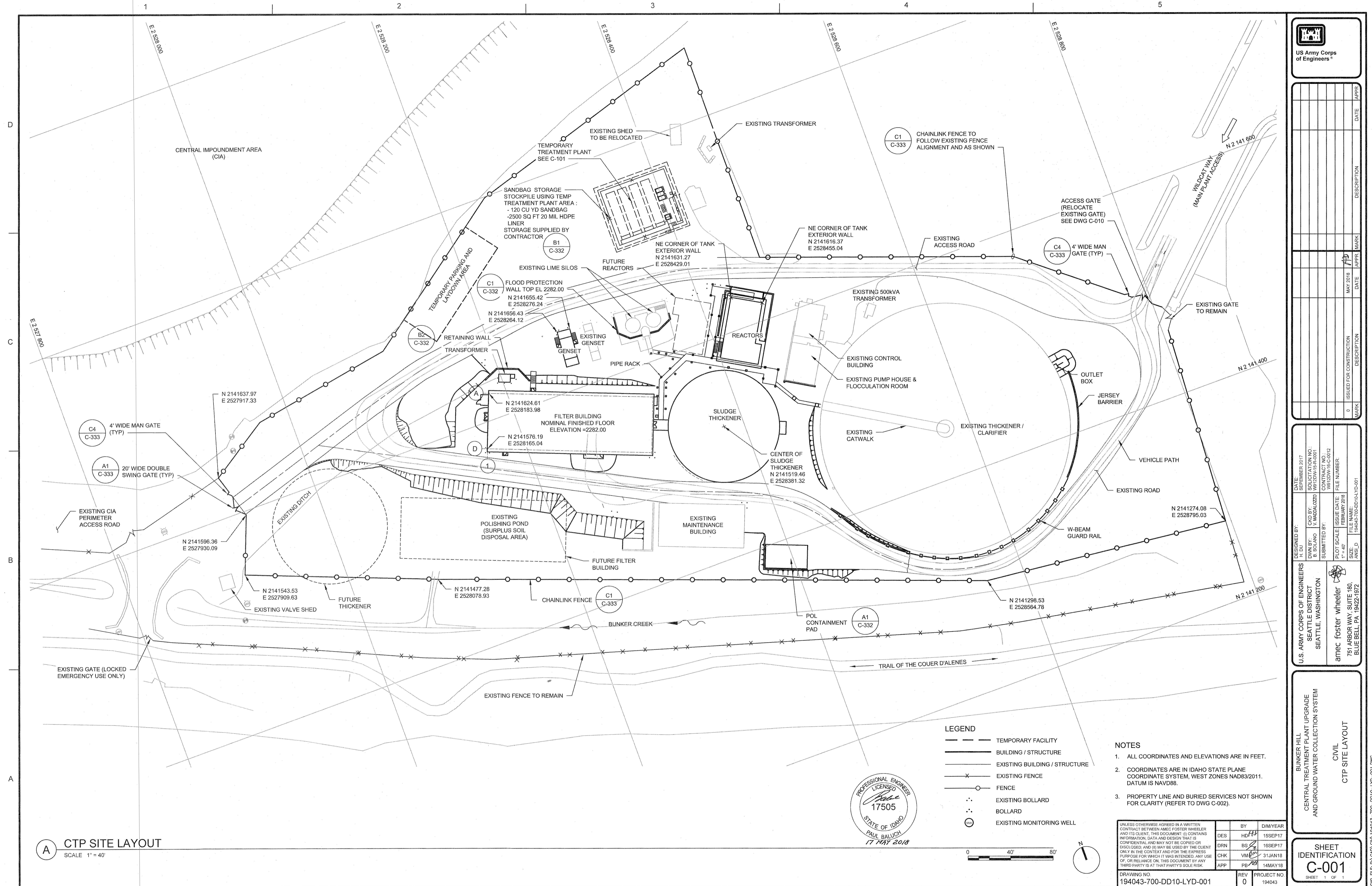
International Code Council, Inc. (ICC), 2015, *2015 International Fire Code*.

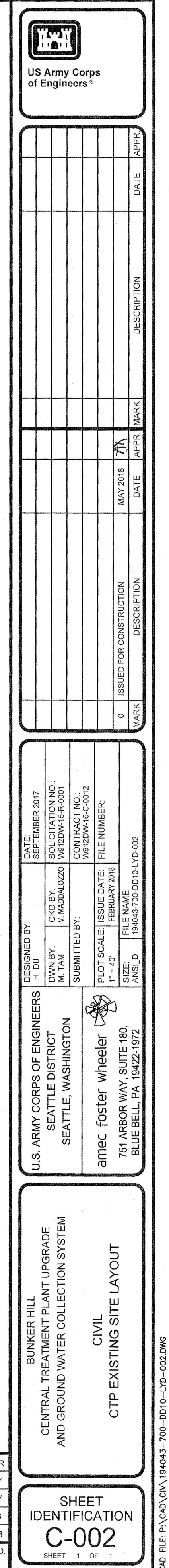
National Oceanic and Atmospheric Administration (NOAA), 1973, Precipitation-Frequency Atlas of the Western United States, Volume V – Idaho. Prepared by J.F. Miller, R.H. Frederick, and R.J. Tracey for the U.S. Department of Agriculture, Soil Conservation Service, Engineering Division.

U.S. Army Corps of Engineers (USACE), 2015, Central Treatment Plant Upgrade and Groundwater Collection System, Bunker Hill - Kellogg, Idaho, Section 01 10 00. USACE Seattle District.

APPENDIX A

Design Package 4A Civil Work Drawings









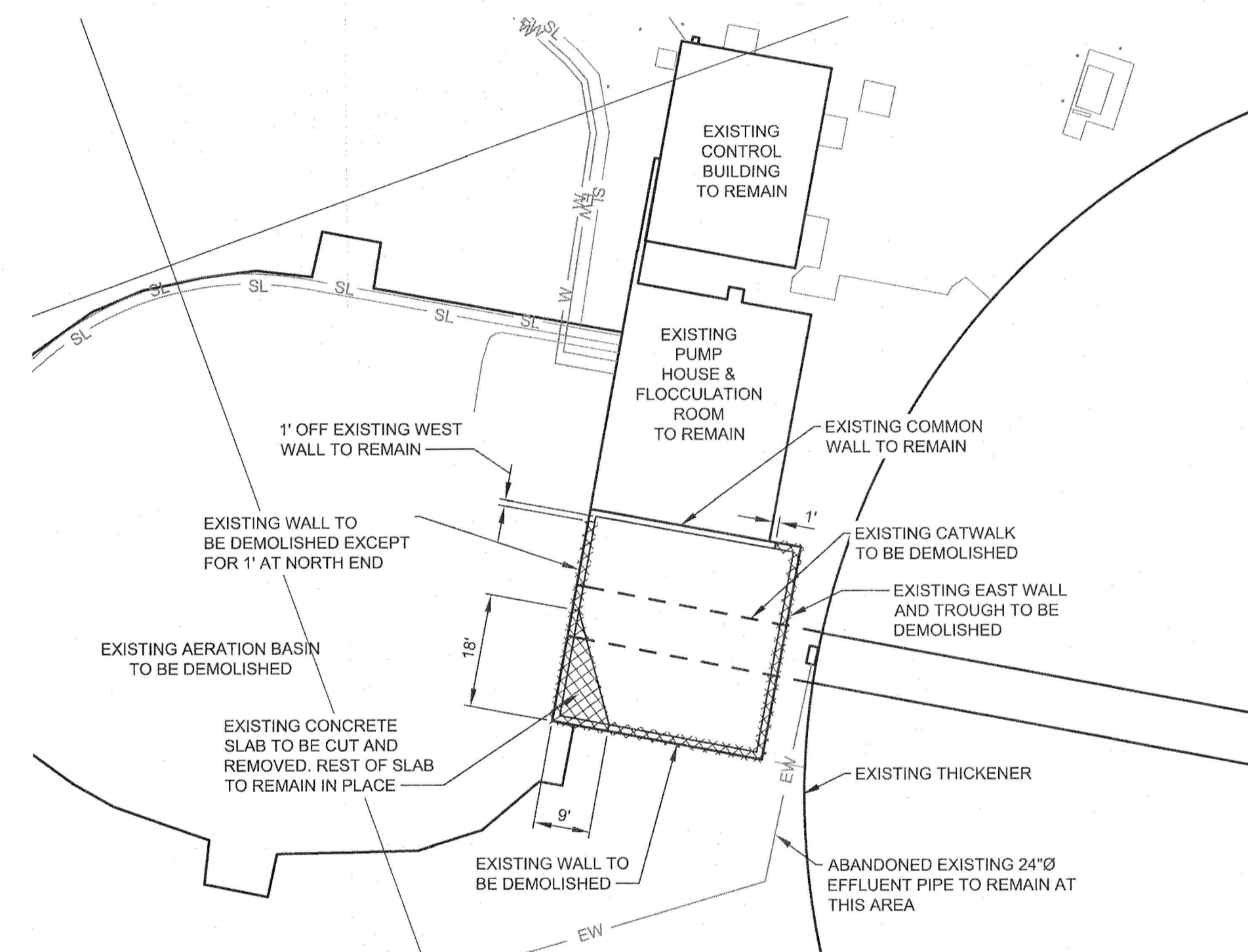


NOTES:

1. ALL DIMENSIONS AND ELEVATIONS ARE IN FEET.
2. COORDINATES ARE IN IDAHO STATE PLANE COORDINATE SYSTEM, WEST ZONES NAD83/2011. DATUM IS NAVD88.

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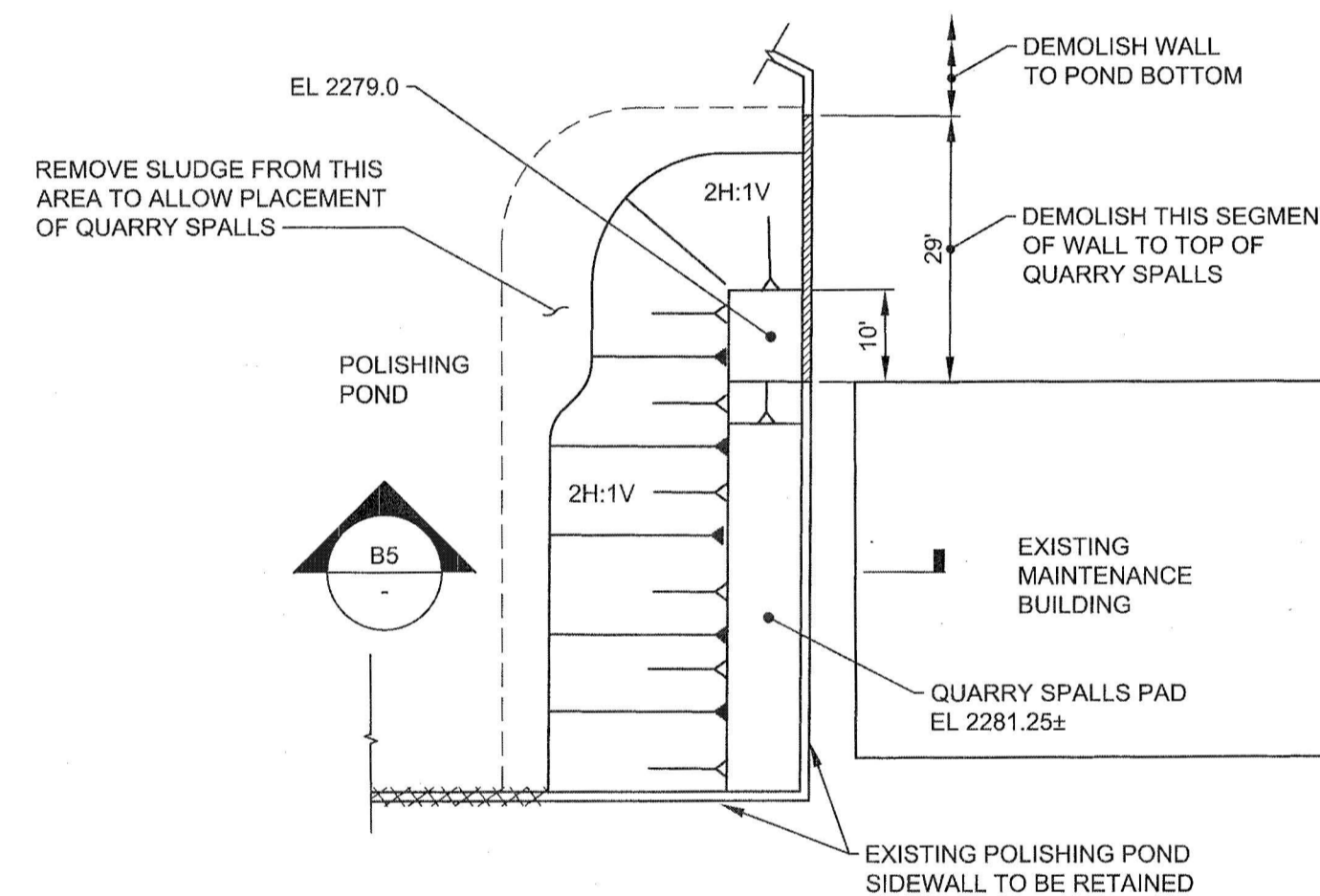
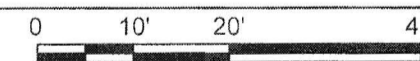
-  EXISTING STRUCTURE / BUILDING TO BE DEMOLISHED
 BUILDING / STRUCTURE TO REMAIN
 SL — EXISTING SLUDGE PIPE
 W — EXISTING WATER LINE



R1 DETAIL - FLOCCULATION BASIN DEMOLITION

SCALE 1" = 20'

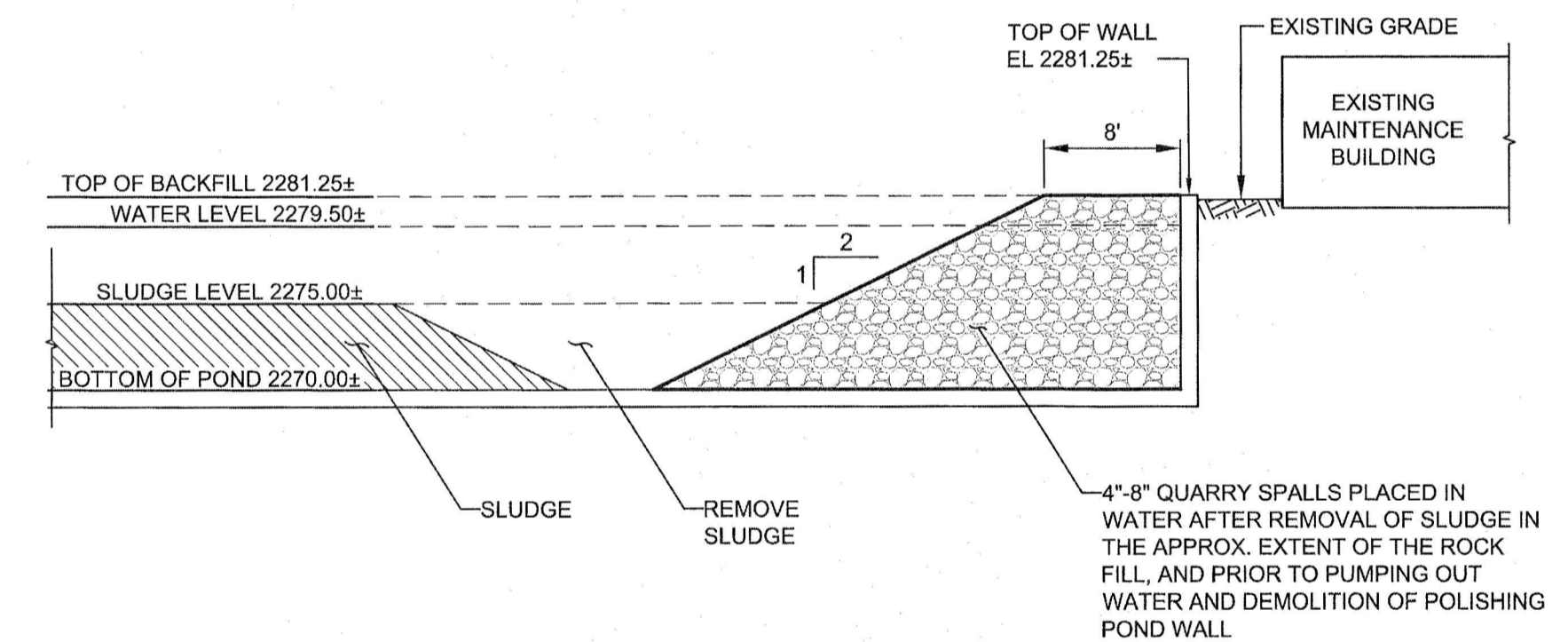
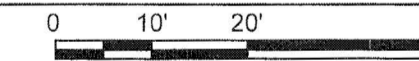
C-010



PLAN - ROCK FILL PRIOR TO PUMPING WATER OUT OF POLISHING POND

SCALE 1" = 20'

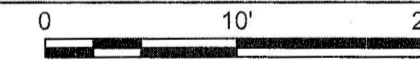
C-010



SECTION

SCALE 1" = 10'

THIS DRAWING



**CENTRAL TREATMENT PLANT UPGRADE
AND GROUND WATER COLLECTION SYSTEM**

CIVIL
CTP DEMOLITION
SECTIONS AND DETAILS

amec foster wheeler &
751 ARBOR WAY, SUITE 180,
BLUE BELL, PA 19422-1972

H. DU	DWN BY: B. SOLANO	CKD BY: V MADDAZZO	SOLICITATION NO: W812DW-15R-0001	SEPTEMBER 2017
SUBMITTED BY:			CONTRACT NO: W812DW-16-C-0012	
PLOT SCALE: 1" = 40'		ISSUE DATE: FEBRUARY 2018	FILE NUMBER:	
SIZE: ANSI_D	FILE NAME: 194043-700-DD10-PLS-011			

[illegible]

SHEET
IDENTIFICATION
C-011

EET 1 OF 1

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194043 700 DD10 BLS 011

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DRN	BS <i>BS</i>	21SEP17
CHK	VM <i>VM</i>	5FEB18
APP	PB <i>PB</i>	14MAY18
REV	0	PROJECT NO. 101062

SAVED: 16-May-18 3:59 PM PLOTTED: 16-May-18 4:05 PM USER: TAM, MAN-'

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A

NOTES

1. ALL DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE.
2. ALL ELEVATIONS ARE IN FEET.
3. NOT USED
4. COORDINATES ARE IN IDAHO STATE PLANE COORDINATE SYSTEM, WEST ZONES NAD83/2011. DATUM IS NAVD88.
5. THE SEDIMENT CONTROL FACILITIES ON THIS DRAWING SHALL BE INSTALLED PRIOR TO ANY EARTHWORKS ON SITE AND SHALL BE MAINTAINED IN PLACE UNTIL COMPLETION OF MAJOR EARTHWORKS INCLUDING DEMOLITION AND PRELOAD WORKS.
6. SILT FENCE AND FIBER WATTLE PER IDAHO TRANSPORTATION DEPARTMENT STANDARD DRAWING P-1-B, TEMPORARY SEDIMENT CONTROL BARRIERS.

SUMP AND PUMP (FIELD FIT)
TOP OF SUMP MATCH EXISTING DITCH
BOTTOM EL 2272±
1 IN 2 YEAR STORM SURFACE RUNOFF
550 CU YD, DETENTION POND VOLUME
350 CU YD, PUMP RATE 100 GPM

TEMPORARY PLASTIC BARRICADE
C/W PLASTIC POSTS AND YELLOW
TAPES AROUND TEMPORARY
DETENTION POND

POTENTIAL FLOODING AREA
(TEMPORARY RAIN WATER
DETENTION POND)

EXISTING VALVE SHED

BERM WITH 2' WIDE CREST,
TOP EL 2275, SIDE SLOPE
2H:1V, COVERED WITH 20 MIL
HDPE LINER OR APPROVED
EQUIVALENT, ANCHOR HDPE
LINER AS PER
MANUFACTURER'S
RECOMMENDATIONS, TYP

6' WIDE SPILLWAY, TOP
EL 2274 COVERED WITH 20 MIL
HDPE LINER OR APPROVED
EQUIVALENT LOWER TO
EL 2272 AT THE END OF
CONSTRUCTION

EXISTING DITCH

EXISTING HEAD HOUSE

EXISTING VAULT

EXISTING POLISHING
POND PUMP HOUSE

EXISTING GENSET

EXISTING LIME SILOS

EXISTING DITCH

TEMP WATER
TREATMENT
PLANT

EXISTING AERATION BASIN

EXISTING 500KVA TRANSFORMER

EXISTING CONTROL BUILDING

EXISTING PUMP HOUSE & FLOCCULATION ROOM

EXISTING FLOCCULATION BASIN

DISCHARGE POINT: EXISTING
TROUGH AT EAST SIDE OF
FLOCCULATION BASIN FOR
TREATMENT IN EXISTING
PROCESS

EXISTING THICKENER

EXISTING MAINTENANCE
BUILDING

3" HDPE DR 17 OVERLAND PIPE
FOR OVERLAND PIPE ANCHOR
FOR OVERLAND HDPE
PIPE ANCHOR SEE
B4
C-431

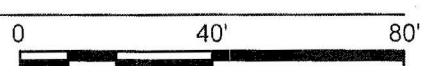
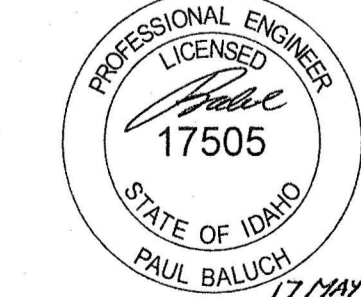
BURIED HDPE PIPE IN 12" STEEL
CASING FOR ROAD CROSSING
BURY STEEL CASING WITH MIN
12" COVER

SILT FENCE, SEE NOTE 6

9"Ø (MIN) FIBER WATTLE
SEE NOTE 6

EL BUNKER CREEK

TRAIL OF THE COUER D'ALENES



- LEGEND
- SF SILT FENCE
 - X FENCE
 - CP DRAINAGE CULVERT
 - SURFACE DRAINAGE DIRECTION

CTP EROSION AND SEDIMENT CONTROL

SCALE 1" = 40'



US Army Corps
of Engineers®

DATE	DESCRIPTION	MARK	DATE	APPR.	DATE	APPR.
0	ISSUED FOR CONSTRUCTION	MARK	MAY 2018	APPR.		

DESIGNED BY: H. DU	DATE: SEPTEMBER 2017	CONTRACT NO.: W912MD-02-0-001	FILE NUMBER: 194043-700-DD-10-GRD-321
DWN BY: P. NAHAL	CHK BY: V. MORALES	CONTRACT NO.: W912MD-02-0-001	FILE NUMBER: 194043-700-DD-10-GRD-321
SUBMITTED BY:	ISSUE DATE: 17 MAY 2018	CONTRACT NO.: W912MD-02-0-001	FILE NUMBER: 194043-700-DD-10-GRD-321

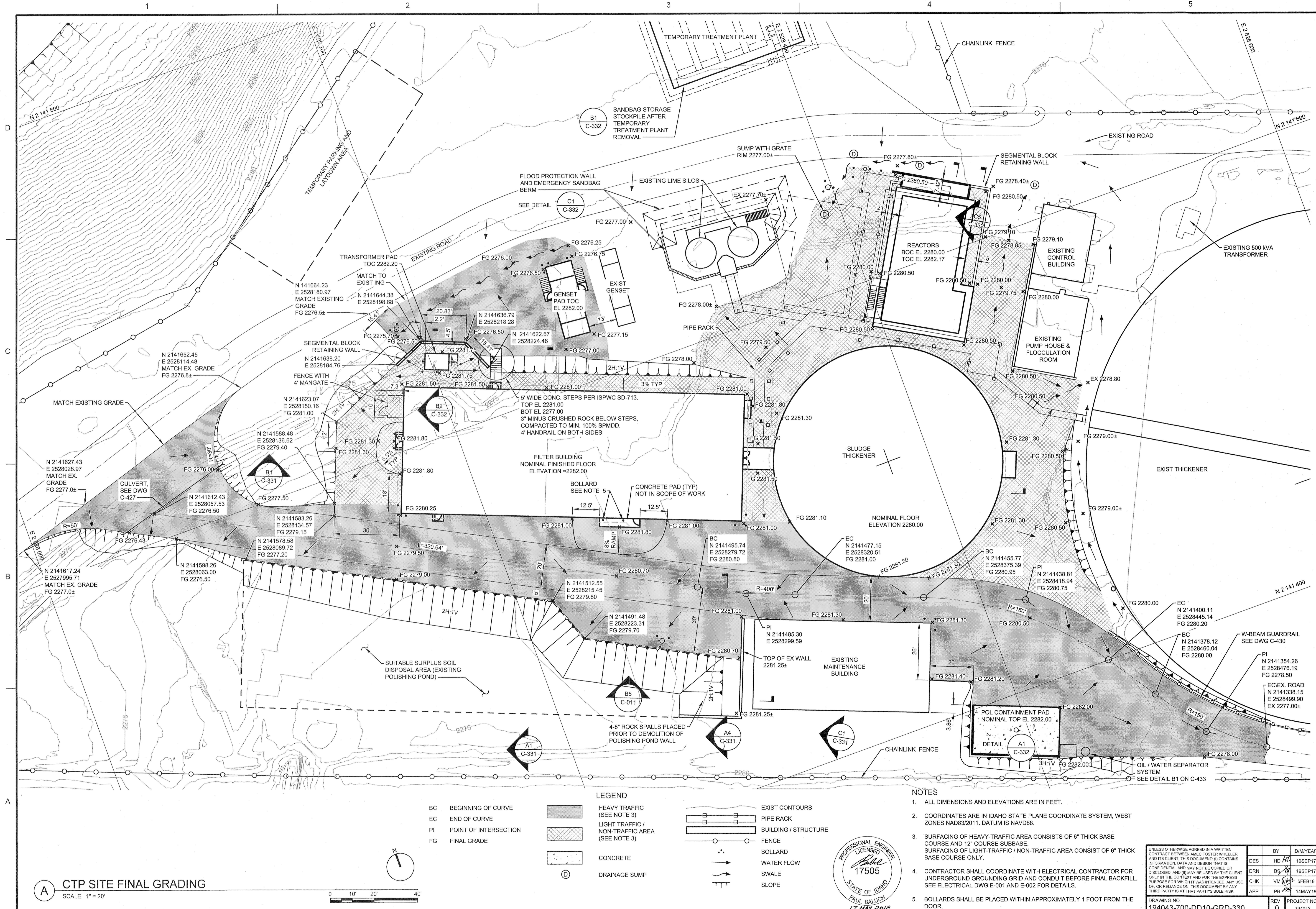
BUNKER HILL
CENTRAL TREATMENT PLANT UPGRADE
AND GROUND WATER COLLECTION SYSTEM

CIVIL
CTP EROSION AND SEDIMENT CONTROL
PLAN

SHEET
IDENTIFICATION
C-321
SHEET 1 OF 1

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DRN	PN	11OCT17	
CHK	VM	5FEB18	
APP	PE	14MAY18	
REV	0	PROJECT NO.	194043

DRAWING NO.
194043-700-DD-10-GRD-321



CTP SITE FINAL GRADING
SCALE 1" = 20'

LEGEND

BC	BEGINNING OF CURVE		HEAVY TRAFFIC (SEE NOTE 3)		PIPE RACK
EC	END OF CURVE		LIGHT TRAFFIC / NON-TRAFFIC AREA (SEE NOTE 3)		BUILDING / STRUCTURE
PI	POINT OF INTERSECTION		CONCRETE		FENCE
FG	FINAL GRADE		DRAINAGE SUMP		BOLLARD
			WATER FLOW		SWALE
			SLOPE		

NOTES

- ALL DIMENSIONS AND ELEVATIONS ARE IN FEET.
- COORDINATES ARE IN IDAHO STATE PLANE COORDINATE SYSTEM, WEST ZONES NAD83/2011. DATUM IS NAVD88.
- SURFACING OF HEAVY-TRAFFIC AREA CONSISTS OF 6" THICK BASE COURSE AND 12" COURSE SUBBASE. SURFACING OF LIGHT-TRAFFIC / NON-TRAFFIC AREA CONSIST OF 6" THICK BASE COURSE ONLY.
- CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR FOR UNDERGROUND GROUNDING GRID AND CONDUIT BEFORE FINAL BACKFILL. SEE ELECTRICAL DWG E-001 AND E-002 FOR DETAILS.
- BOLLARDS SHALL BE PLACED WITHIN APPROXIMATELY 1 FOOT FROM THE DOOR.

PROFESSIONAL ENGINEER
LICENSED
17505
PAUL BALUCH
17 MAY 2018

US Army Corps of Engineers

DATE	SEPTEMBER 2017	DESIGNED BY	H DU	CAD BY	WASH/0220	SUBMITTED BY	FILE NUMBER
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PROJECT NO.	194043-700-DD10-GRD-330	FILE NAME	194043-700-DD10-GRD-330				
DATE	MAY 2018	DATE	MAY 2018	DATE	MAY 2018	DATE	MAY 2018
DESCRIPTION	ISSUED FOR CONSTRUCTION	DESCRIPTION	ISSUED FOR CONSTRUCTION	DESCRIPTION	ISSUED FOR CONSTRUCTION	DESCRIPTION	ISSUED FOR CONSTRUCTION
MARK	0	MARK	0	MARK	0	MARK	0

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SEATTLE DISTRICT
SEATTLE, WASHINGTON

amtec foster wheeler
751 ARBOR WAY, SUITE 180
BLUE BELL, PA 19422-1972

CIVIL
CTP SITE FINAL GRADING
AND SURFACE DRAINAGE PLAN

SHEET IDENTIFICATION
C-330
SHEET 1 OF 1

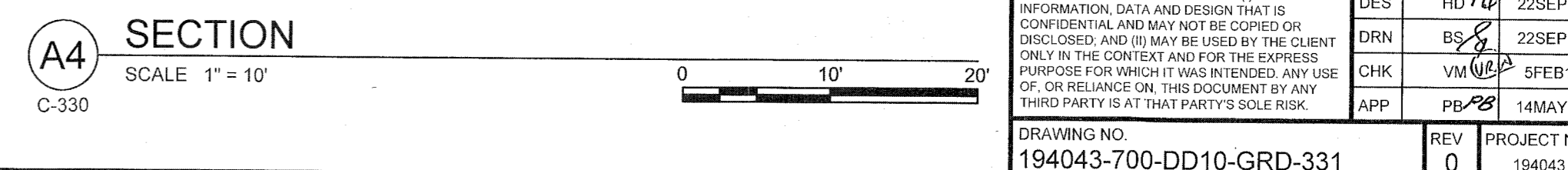
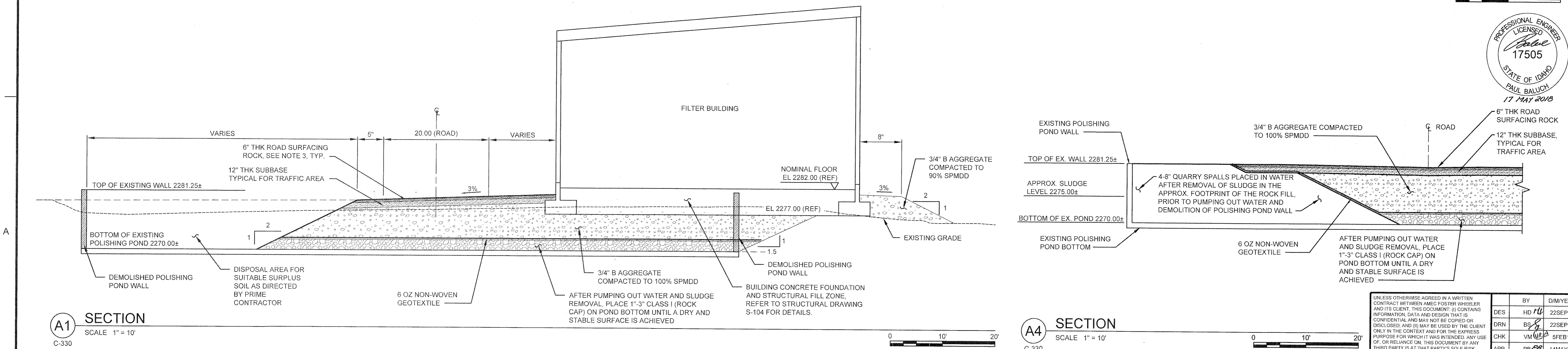
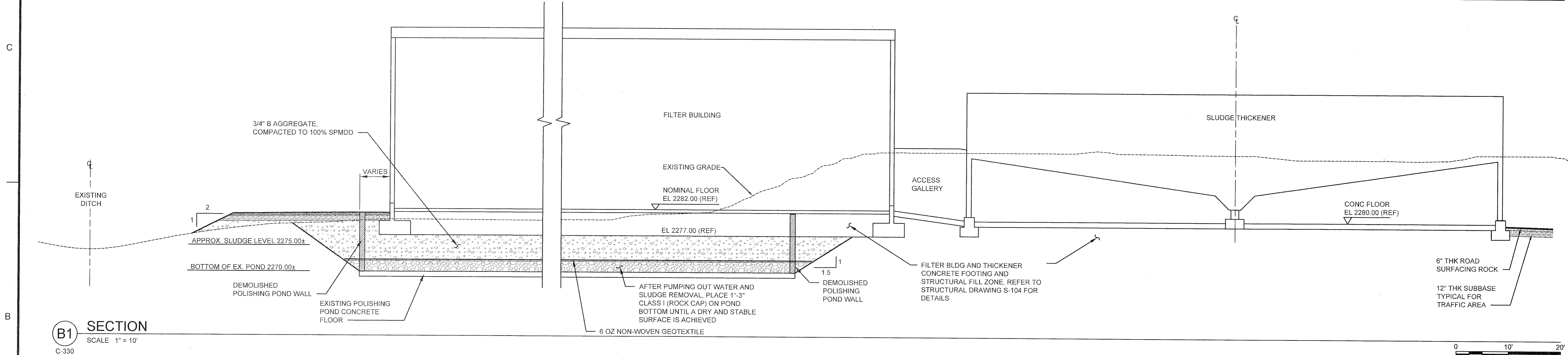
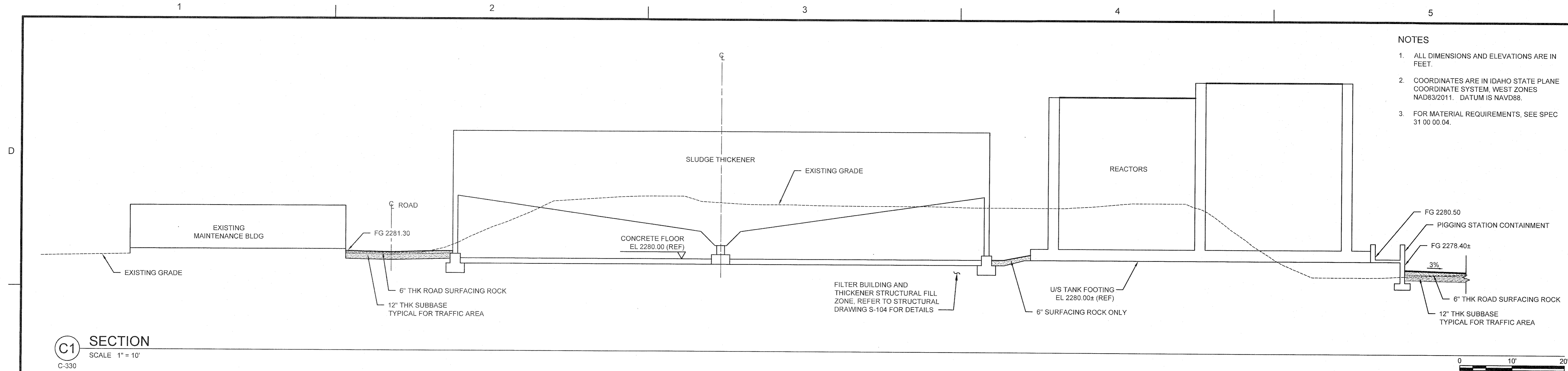
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CHK VM
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19SEP17
19SEP17
5FEB18
14MAY18

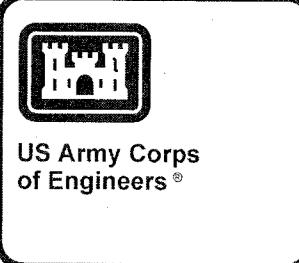
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 2. COORDINATES ARE IN IDAHO STATE PLANE COORDINATE SYSTEM, WEST ZONES NAD83/2011. DATUM IS NAVD88.
 3. FOR MATERIAL REQUIREMENTS, SEE SPEC 31 00 00.04.



DATE	DESCRIPTION	MARK	DATE	APPROVED
SEPTEMBER 2017	DESIGNED BY: H. DU			
	DRAWN BY: B. SOLANO			
	SUBMITTED BY: T. MADDALEZZO			
	PROJECT SCALE: 1" = 10'			
	FILE NUMBER: 194043-700-DD10-GRD-331			
	ISSUED FOR CONSTRUCTION			
	DATE: MAY 2018			
	MARK			

DATE: SEPTEMBER 2017	SOLICITATION NO.: W812DWA-16-R-001	CONTRACT NO.: W812DWA-16-C-012
DESIGNED BY: H. DU	CHKD BY: T. MADDALEZZO	FILE NUMBER: 194043-700-DD10-GRD-331
DRAWN BY: B. SOLANO	SUBMITTED BY: T. MADDALEZZO	PROJECT SCALE: 1" = 10'
PROJECT SCALE: 1" = 10'	FILE NUMBER: 194043-700-DD10-GRD-331	ISSUED FOR CONSTRUCTION
DATE: MAY 2018	MARK	

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751 ARBOR WAY SUITE 180
BLUE BELLS, PA 19422-1972

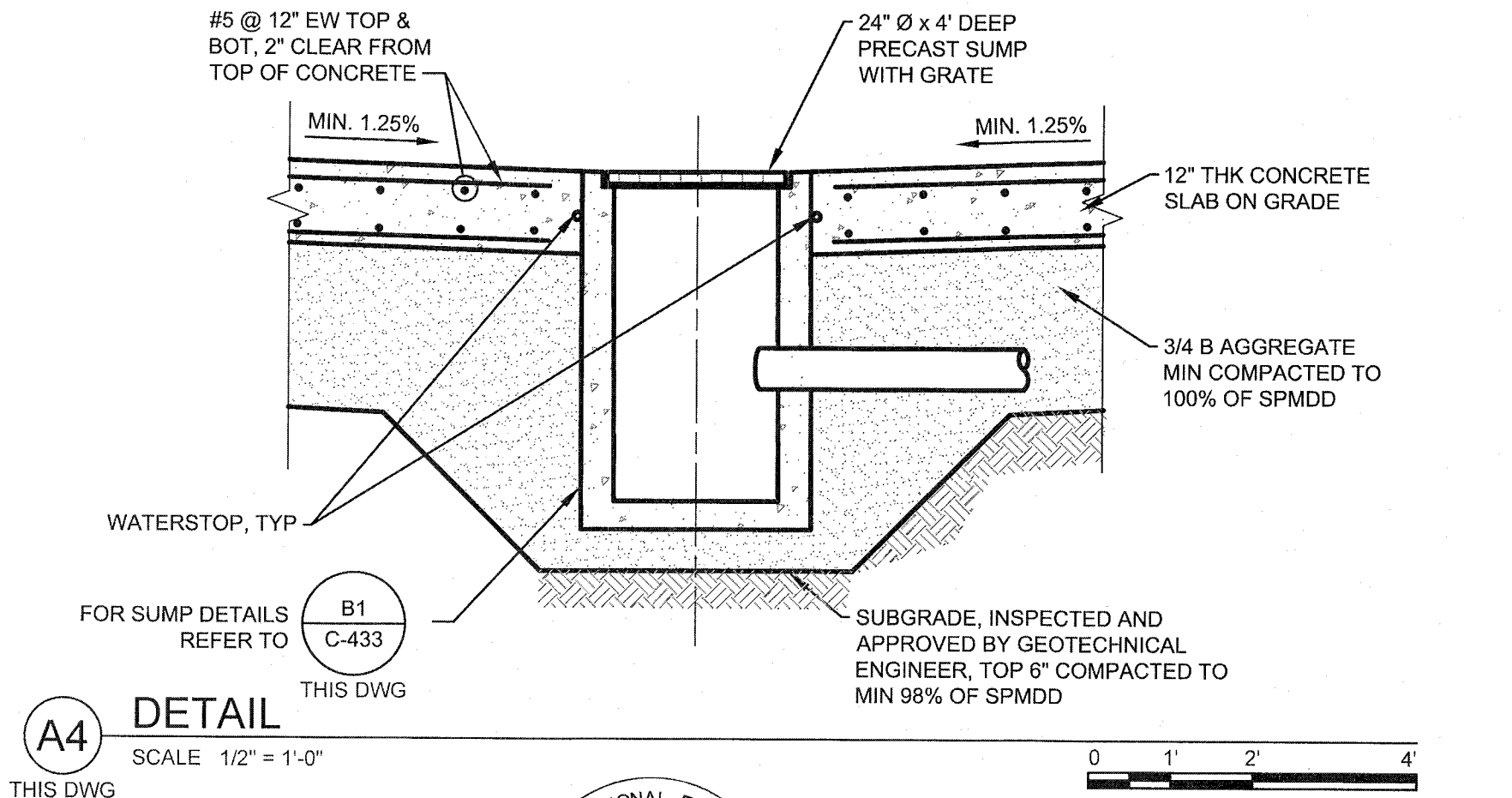
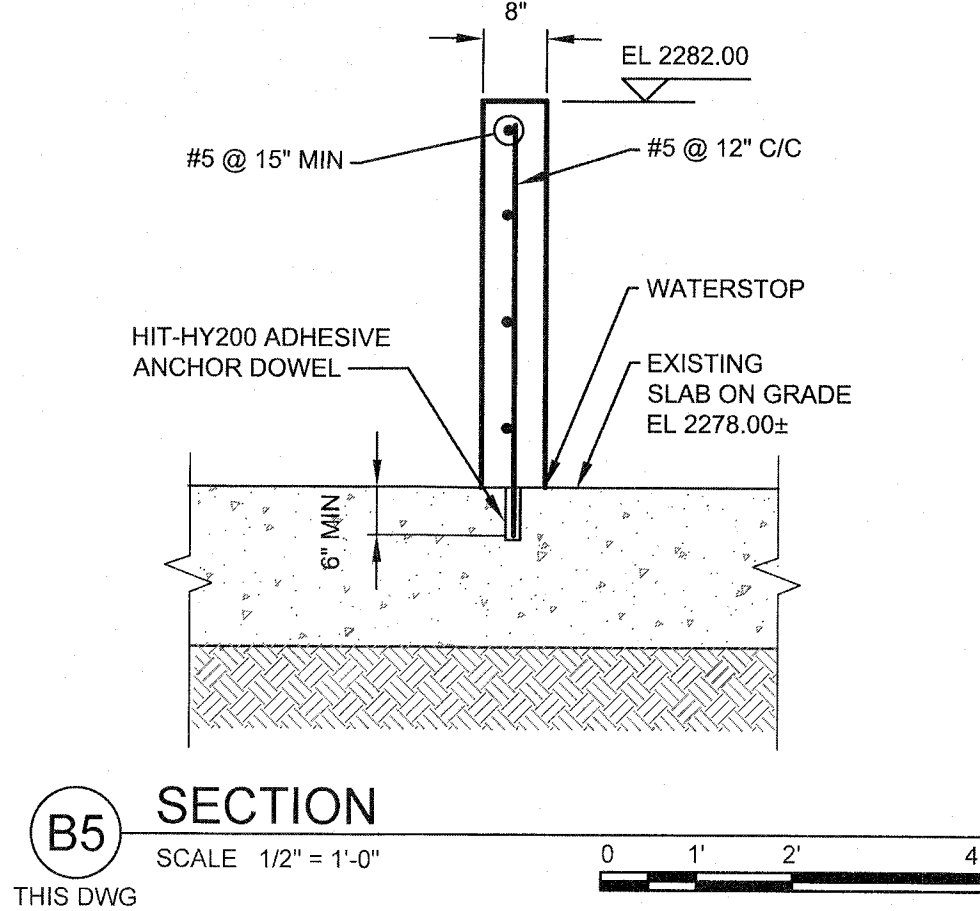
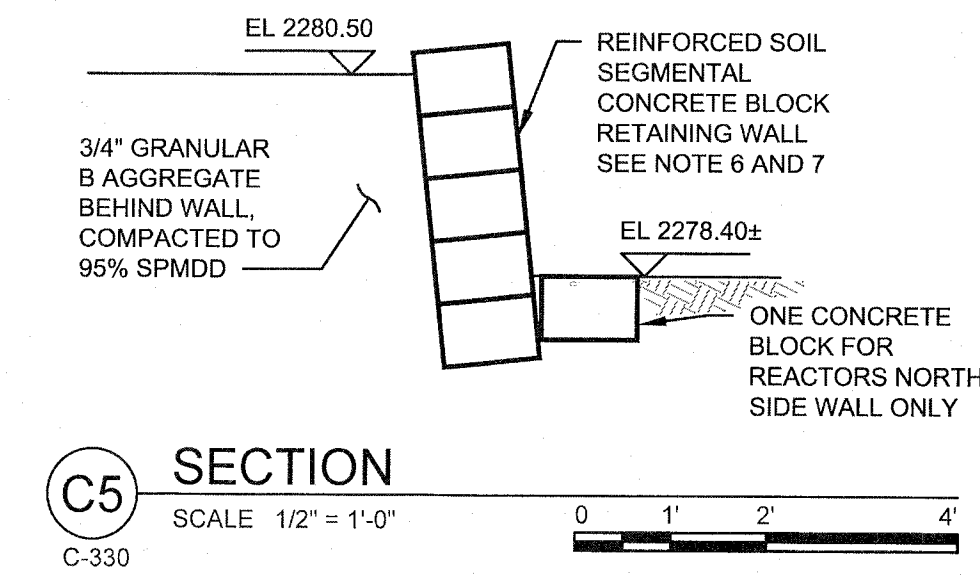
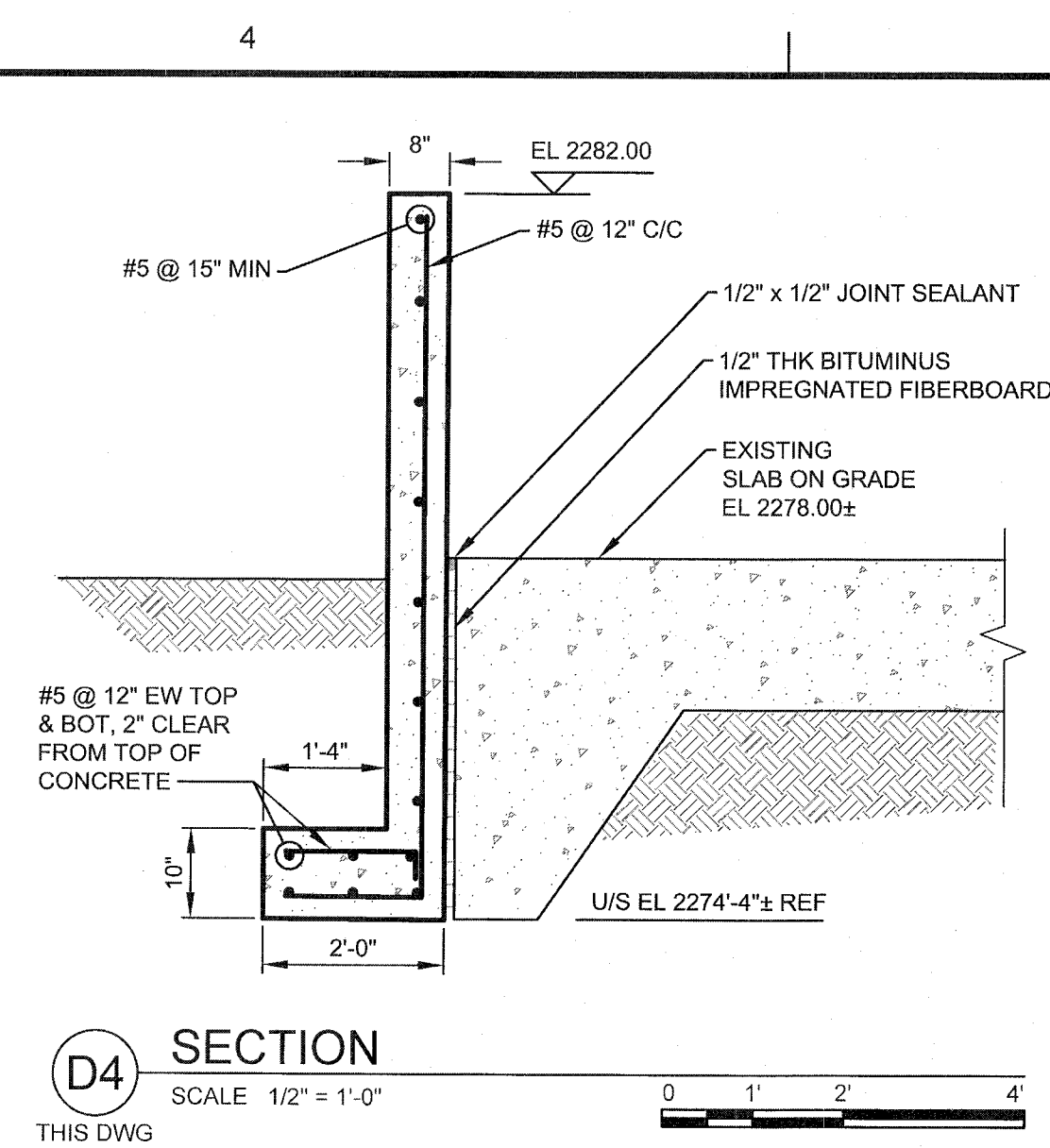
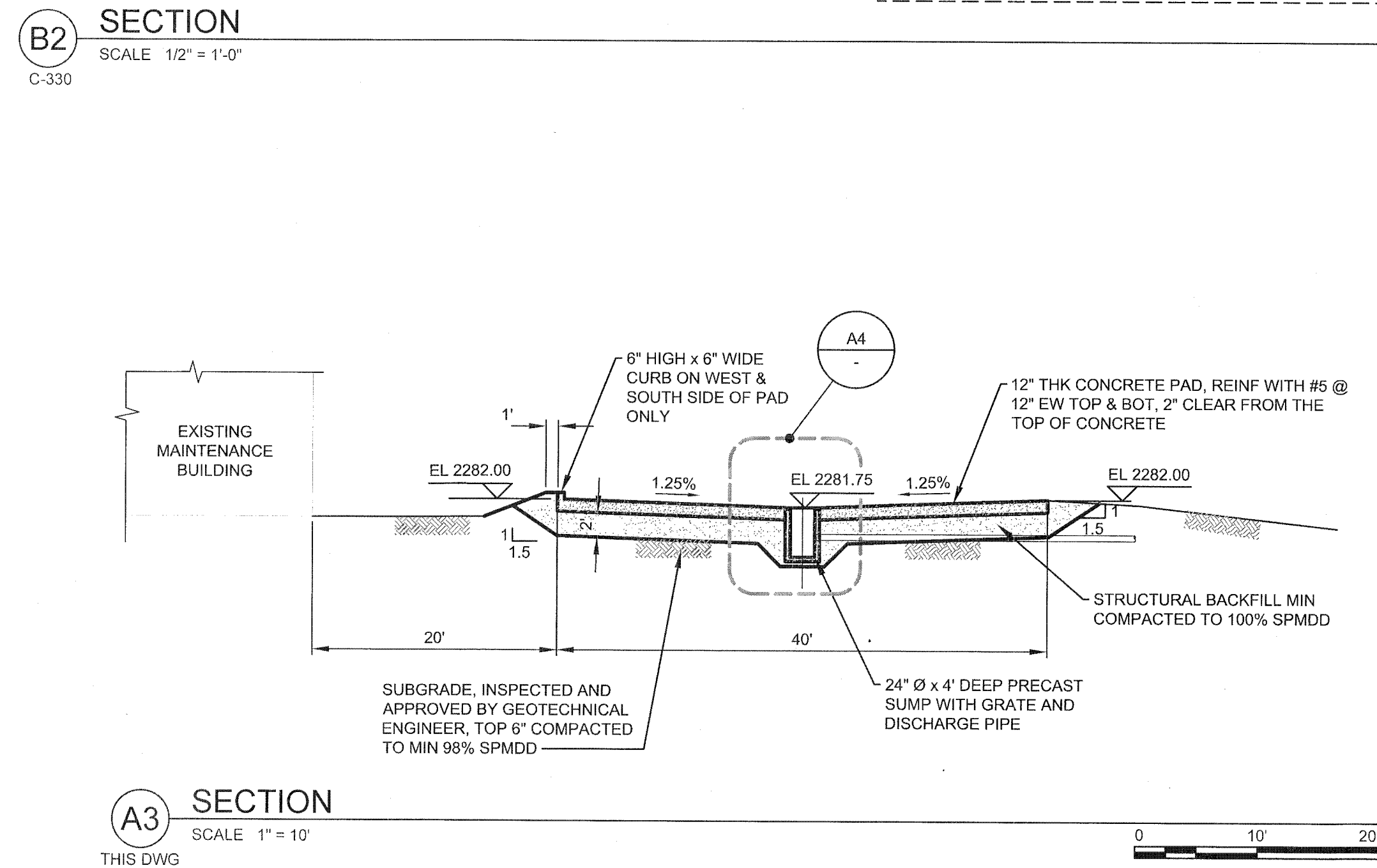
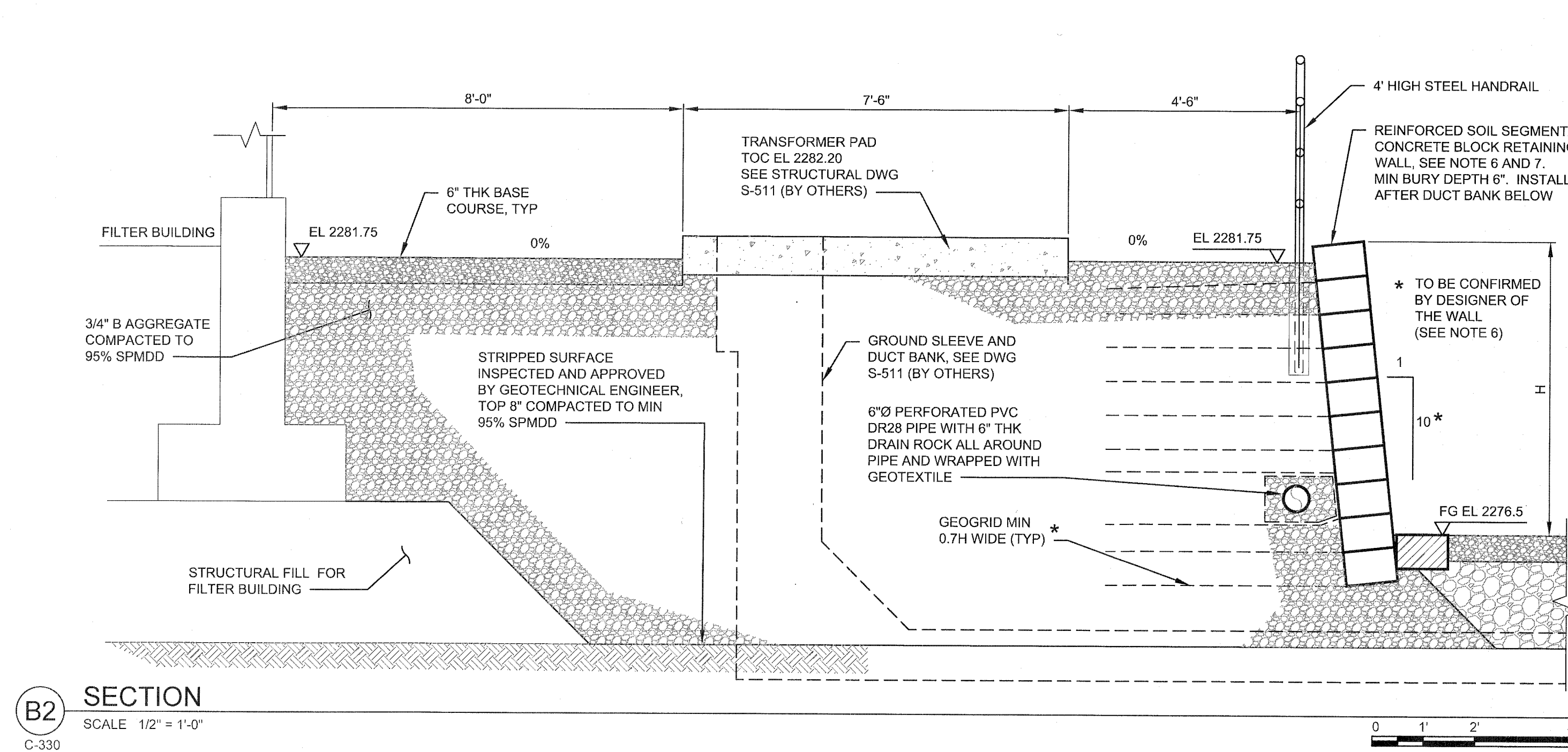
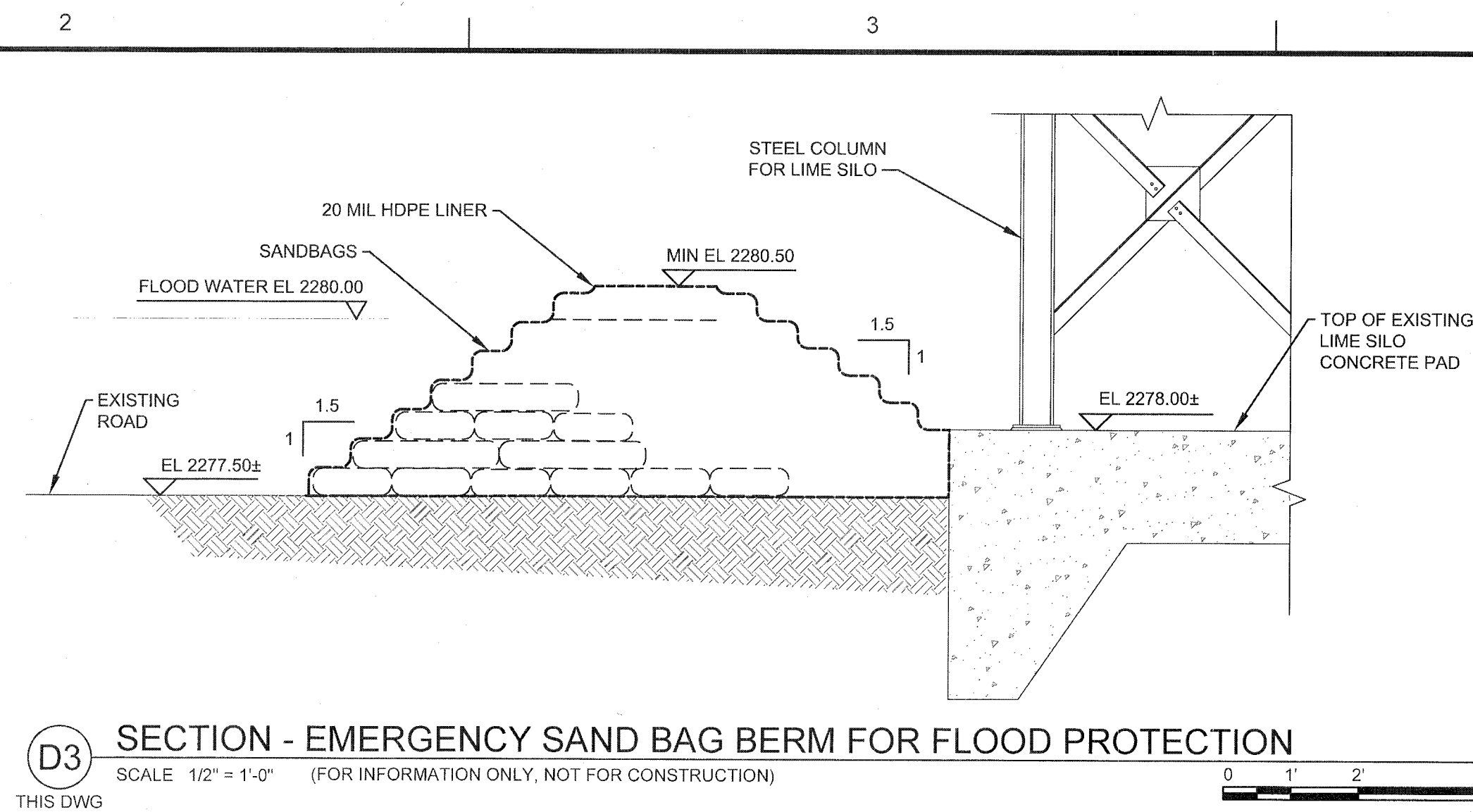
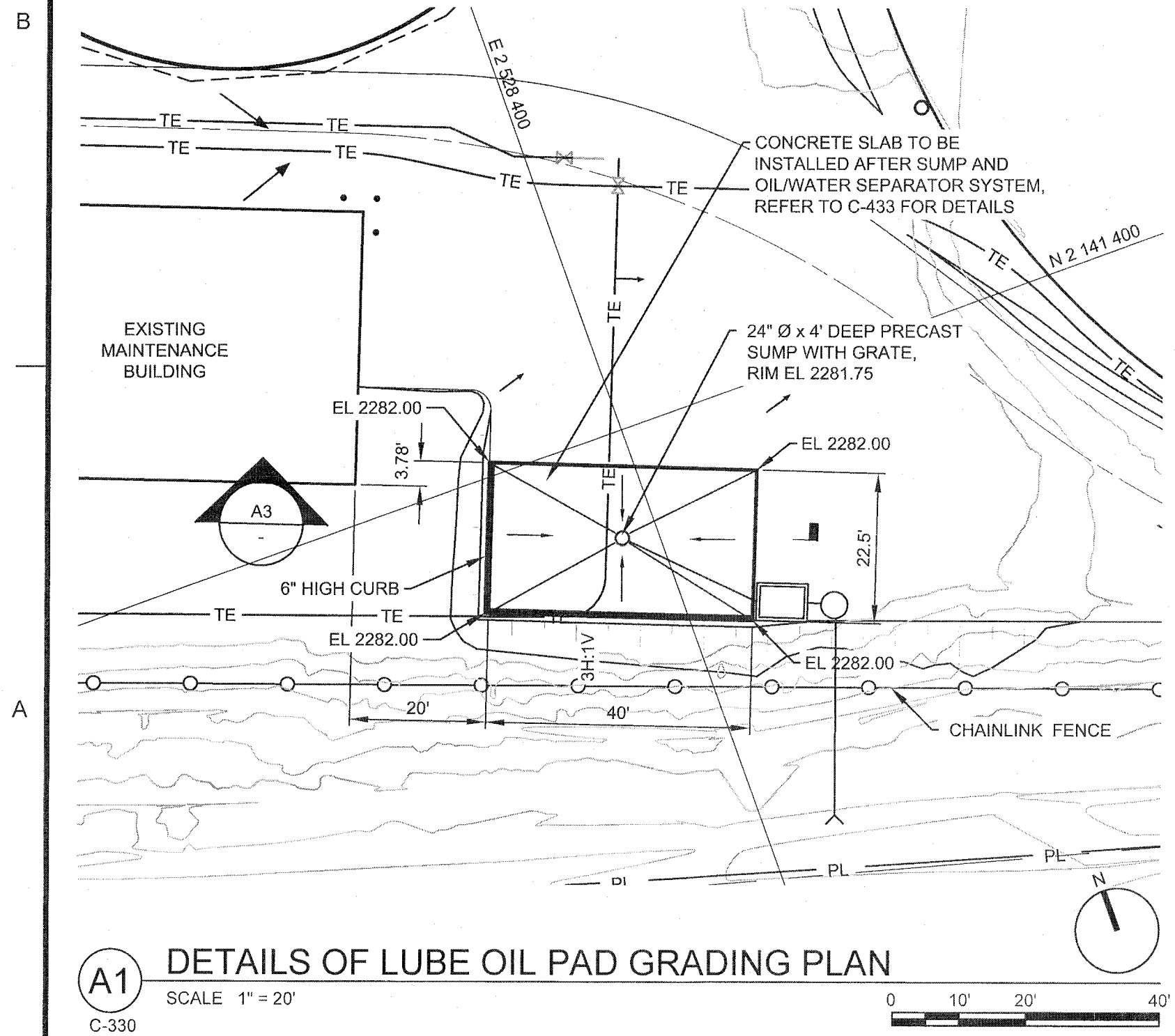
BUNKER HILL
CENTRAL TREATMENT PLANT UPGRADE
AND GROUND WATER COLLECTION SYSTEM

CIVIL
FINAL GRADING
SECTIONS & DETAILS - 1

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DRN	BS	22SEP17
CHK	VM	14MAY18
APP	PE	14MAY18
REV	0	PROJECT NO. 194043


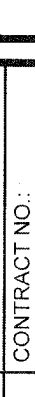
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NOTES

1. ALL DIMENSIONS AND ELEVATIONS ARE IN FEET / INCHES.
2. COORDINATES ARE IN IDAHO STATE PLANE COORDINATE SYSTEM, WEST ZONES NAD83/2011. DATUM IS NAVD88.
3. SANDBAG SHALL BE WOVEN POLYPROPYLENE TYPE TREATED FOR UV RESISTANCE, 14" - 18" WIDE AND 30" - 36" LONG OR APPROVED SIMILAR SIZE AND FILLED WITH SAND BETWEEN 2/3 TO 1/2 FULL.
4. THE 2500 SQ FT HDPE LINER FOR SANDBAG BERM CONSTRUCTION EXCLUDES THE UV RESISTANT HDPE COVER.
5. SEE DWG C-001 FOR SANDBAG STORAGE VOLUME REQUIREMENTS.
6. THE REINFORCED SOIL SEGMENTAL CONCRETE BLOCK RETAINING WALL SHALL BE DESIGNED BY THE CONTRACTOR (THE DESIGN SHALL BE SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN IDAHO), AND ITS OVERALL STABILITY SHALL BE REVIEWED BY GEOTECHNICAL ENGINEER WHO WILL ALSO APPROVE THE FOUNDATION SUBGRADE.
7. FOR SEGMENTAL CONCRETE BLOCK RETAINING WALL SPECIFICATIONS, SEE SPECIFICATION 32 32.3.
8. FOR CONCRETE SPECIFICATIONS, SEE SECTION 03 30 00.00 14.

 US Army Corps of Engineers		DESIGNED BY:		DATE:	
U.S. ARMY CORPS OF ENGINEERS		SEPTEMBER 2017			
SEATTLE DISTRICT		CKD BY:			
SEATTLE, WASHINGTON		14ADADL0220			
amec foster wheeler		SUBMITTED BY:			
751 ARBOR WAY, SUITE 180,		CONTRACT NO:			
BLUE BELL, PA 19422-1972		V912DV-16-C-2012			
		FILE NUMBER:			
CTP SITE FINAL GRAVING		ISSUE DATE:			
SECTIONS AND DETAILS - 2		FEBRUARY 2018			
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SHEET IDENTIFICATION		SIZE:			
C-332		ANSI D			
SHEET 1 OF 1		15604575040D16-GRD-332			

MARK	DESCRIPTION	DATE	APPR	MARK	DESCRIPTION	DATE	APPR
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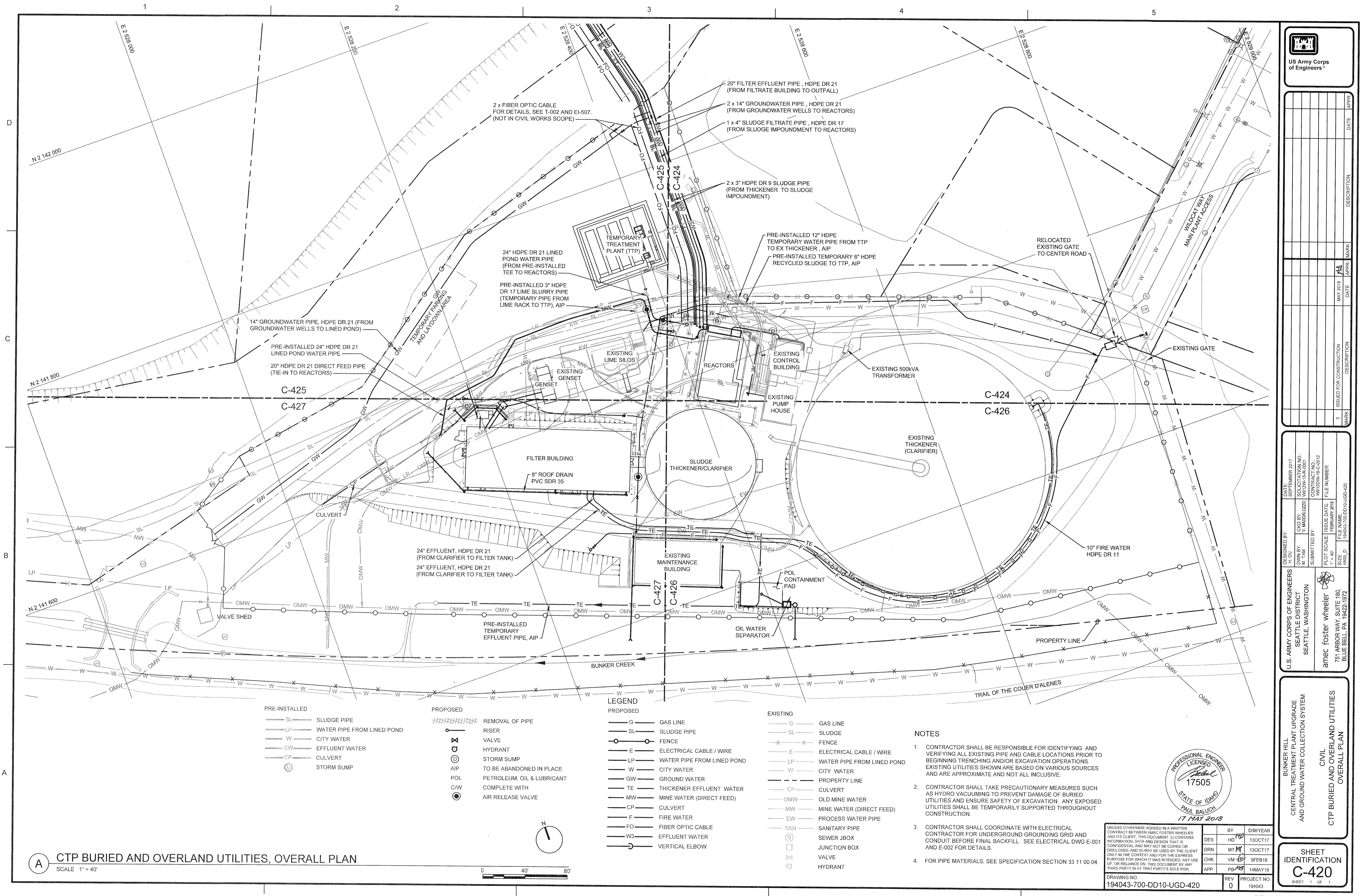
BUNKER HILL
 CENTRAL TREATMENT PLANT UPGRADE
 AND GROUND WATER COLLECTION SYSTEM

CIVIL
 CTP SITE FINAL GRAVING
 SECTIONS AND DETAILS - 2

SHEET IDENTIFICATION
C-332
 SHEET 1 OF 1

15-165-M-18-1201-D1 15604575040D16-GRD-332-0001

CADD FILE: E:\CADD\15604575040D16-GRD-332.dwg



US Army Corps of Engineers

DATE	DESCRIPTION	MARK	DATE	DESCRIPTION	MARK
0	ISSUED FOR CONSTRUCTION		MAY 2018		

DESIGNED BY: **amtec foster wheeler**
H. DU
SEATTLE DISTRICT
SEATTLE, WASHINGTON

DATE: SEPTEMBER 2017
SOLICITATION NO.: W32W-15-R-001
CONTRACT NO.: W32W-15-R-001
FILE NUMBER: 194043-700-DD10-UGD-420

PROFESSIONAL ENGINEER
LICENSED
17505
STATE OF IDAHO
PAUL BALUCH
17 MAY 2018

DES	BY	DATE
HD	HD	13OCT17
DRN	MT	13OCT17
CHK	VM	5FEB18
APP	PB	14MAY18

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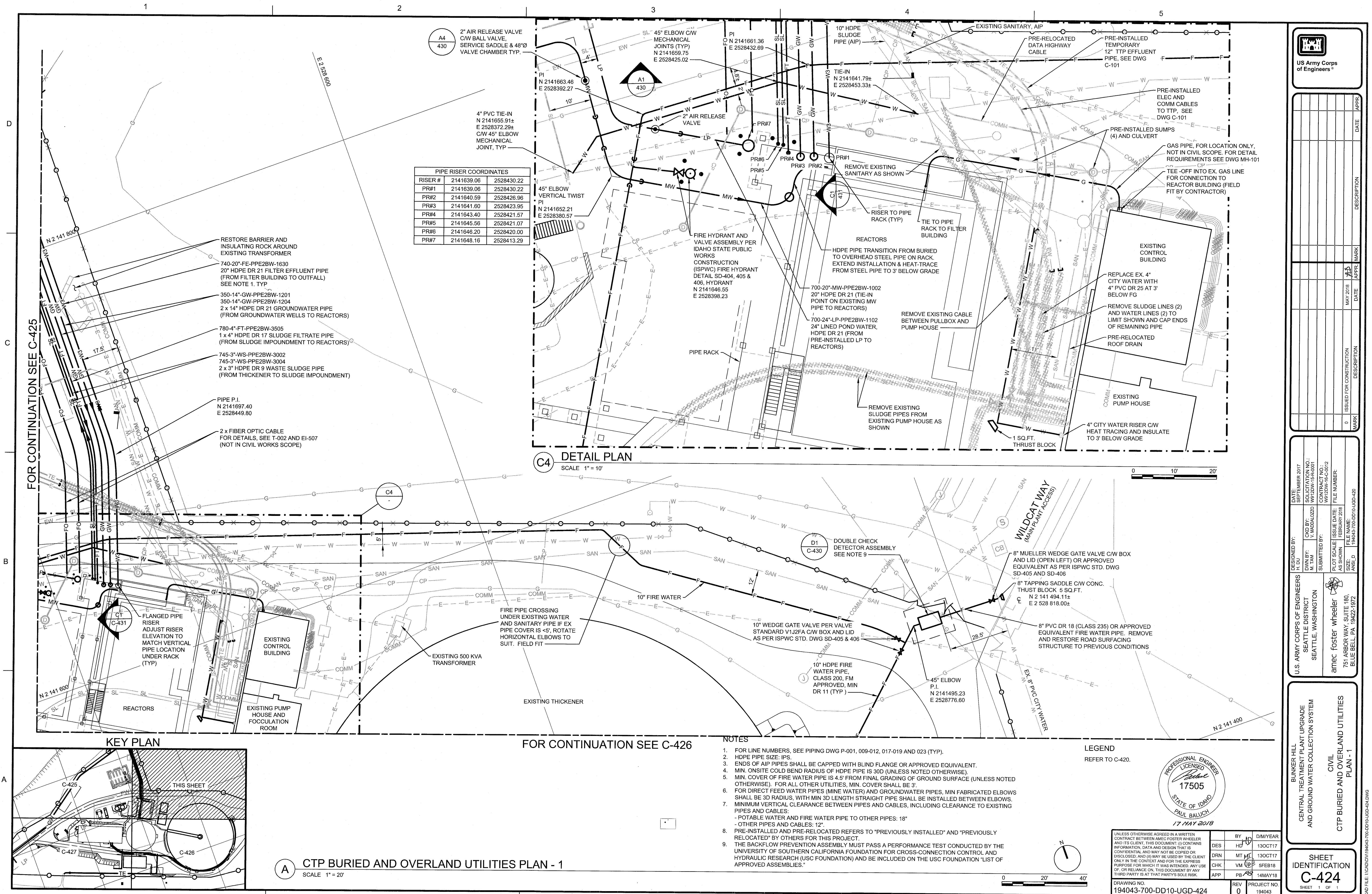
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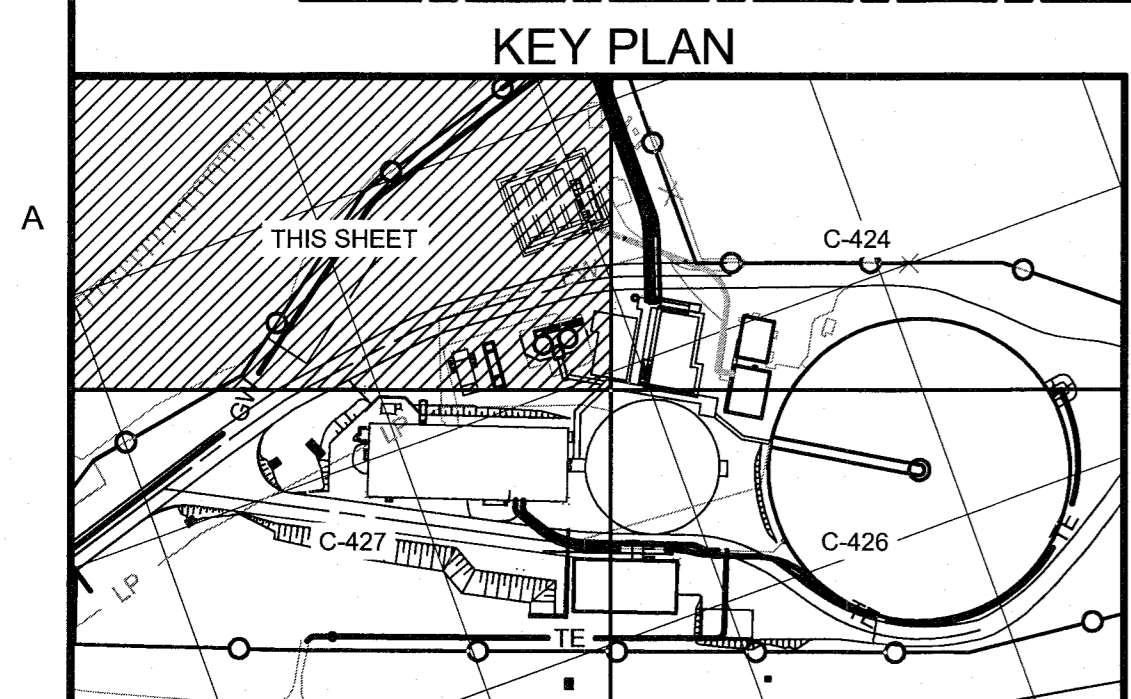
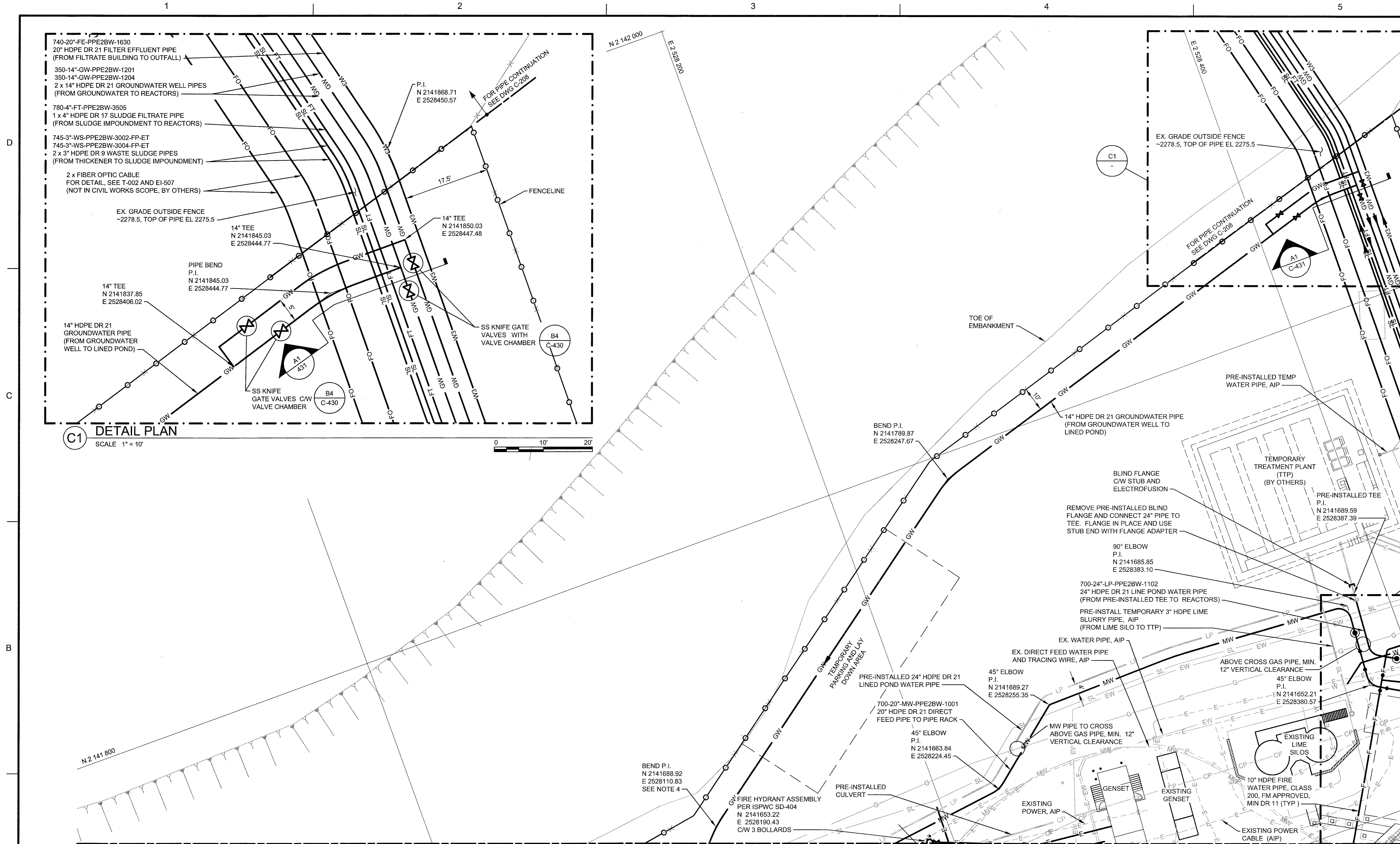
REV 0 PROJECT NO. 194043

BUNKER HILL
CENTRAL TREATMENT PLANT UPGRADE
AND GROUND WATER COLLECTION SYSTEM

CIVIL
CTP BURIED AND OVERLAND UTILITIES
OVERALL PLAN

SHEET IDENTIFICATION
C-420
SHEET 1 OF 1

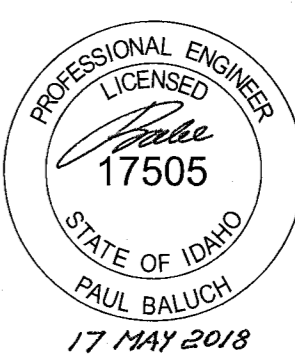




CTP BURIED AND OVERLAND UTILITIES PLAN - 2
SCALE 1" = 20'

- NOTES**
- FOR LINE NUMBERS, SEE PIPING DWG P-001, 009-012, 017-019 AND 023 (TYP).
 - HDPE PIPE SIZE: IPS.
 - ENDS OF AIP PIPES SHALL BE CAPPED WITH BLIND FLANGE OR APPROVED EQUIVALENT.
 - MIN. ONSITE COLD BEND RADIUS OF HDPE PIPE IS 30D (UNLESS NOTED OTHERWISE).
 - MIN. COVER OF FIRE WATER PIPE IS 4.5' FROM FINAL GRADING OF GROUND SURFACE (UNLESS NOTED OTHERWISE). FOR ALL OTHER UTILITIES, MIN. COVER SHALL BE 3'.
 - FOR DIRECT FEED WATER PIPES AND GROUNDWATER PIPES, MIN FABRICATED ELBOWS SHALL BE 3D RADIUS, WITH MIN 3D LENGTH STRAIGHT PIPE SHALL BE INSTALLED BETWEEN ELBOWS.
 - MINIMUM VERTICAL CLEARANCE BETWEEN PIPES AND CABLES, INCLUDING CLEARANCE TO EXISTING PIPES AND CABLES:
 - POTABLE WATER AND FIRE WATER PIPE TO OTHER PIPES: 18"
 - OTHER PIPES AND CABLES: 12"
 - PRE-INSTALLED AND PRE-RELOCATED REFERS TO "PREVIOUSLY INSTALLED" AND "PREVIOUSLY RELOCATED" BY OTHERS FOR THIS PROJECT.

LEGEND
REFER TO C-420.



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DRN	MT	13OCT17	
CHK	VM	5FEB18	
APP	PG	14MAY18	
DRAWING NO.	194043-700-DD10-UGD-425	PROJECT NO.	194043

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

amtec foster wheeler
751 ARBOR WAY SUITE 100
BLUE BELT PA 154221972

DATE	ISSUED FOR CONSTRUCTION	DATE	APPROVAL	DESCRIPTION
0	0	MAY 2018	7/5	

DATE	APPROVAL	DESCRIPTION
17 MAY 2018		

BUNKER HILL
CENTRAL TREATMENT PLANT UPGRADE
AND GROUND WATER COLLECTION SYSTEM

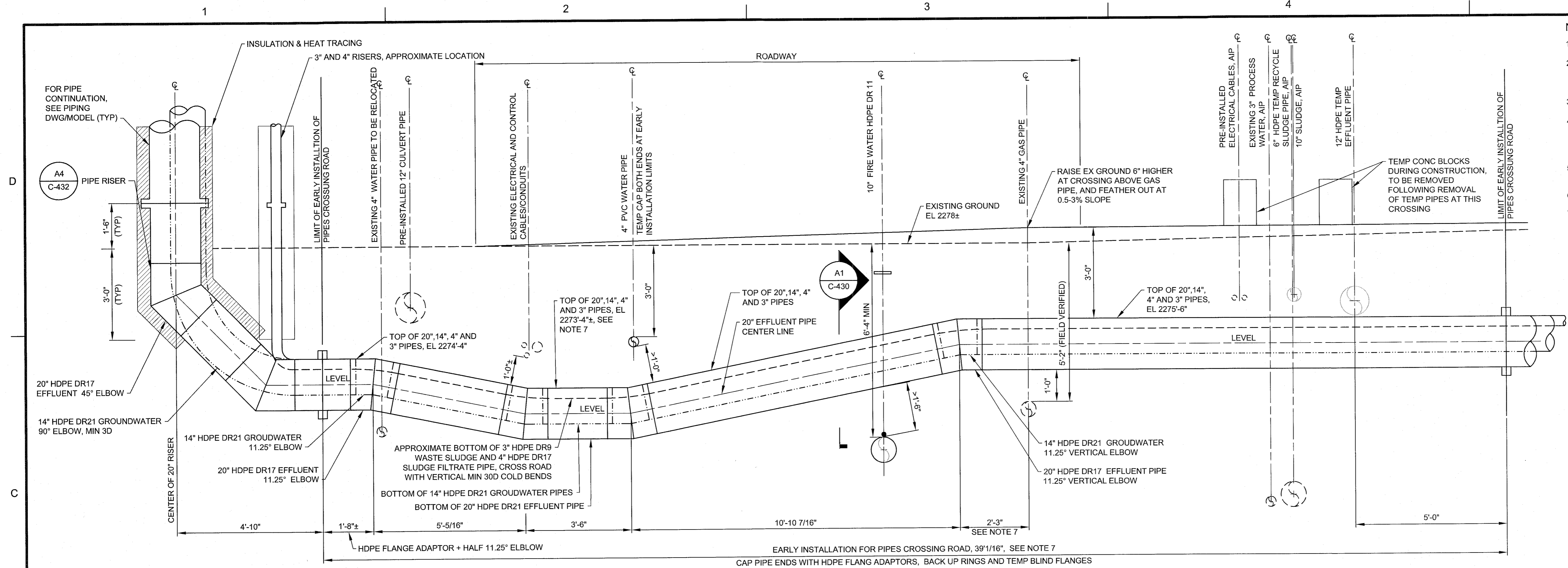
CIVIL
CTP BURIED AND OVERLAND UTILITIES
PLAN - 2

SHEET IDENTIFICATION
C-425
SHEET 1 OF 1

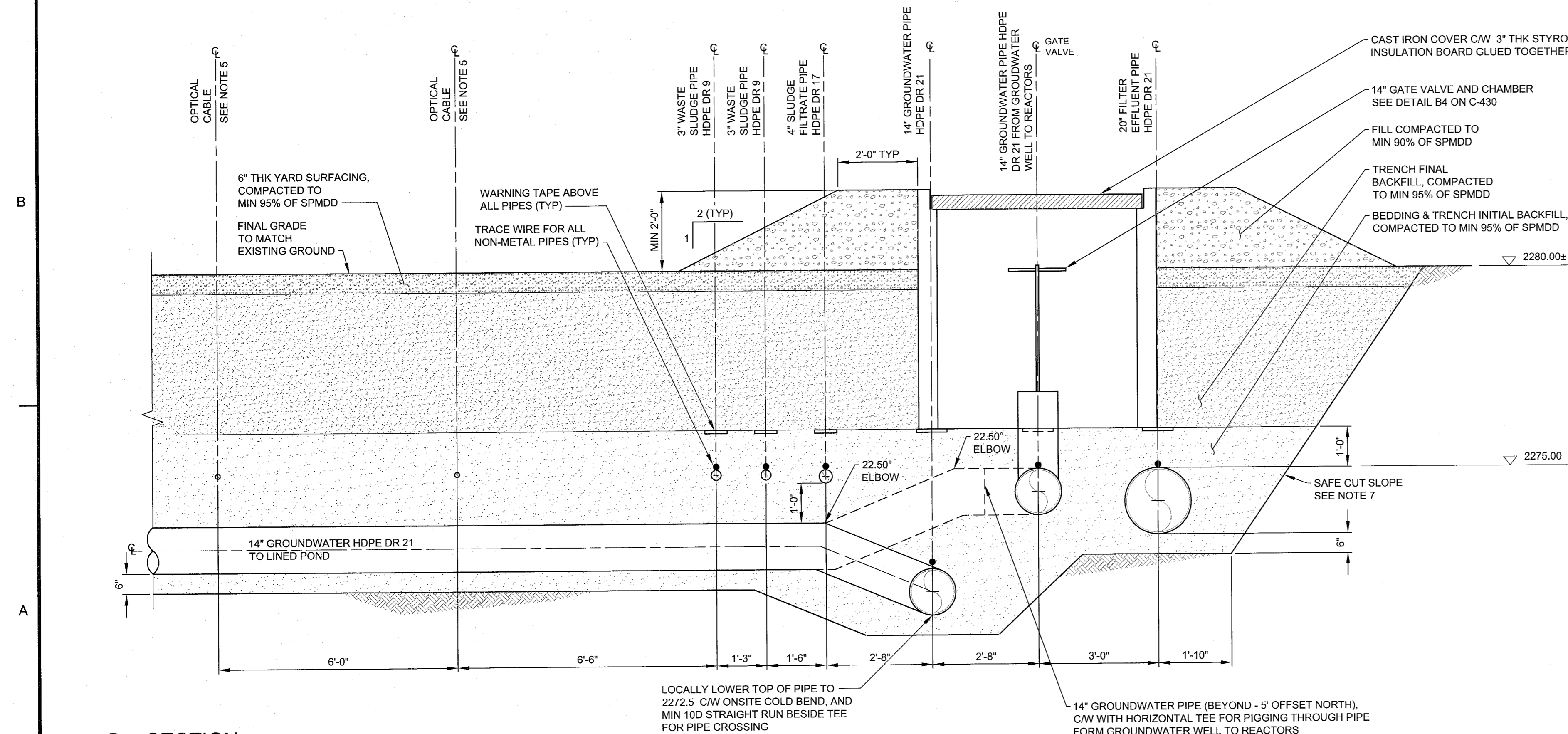
FOR CONTINUATION SEE C-424

FOR CONTINUATION SEE C-427

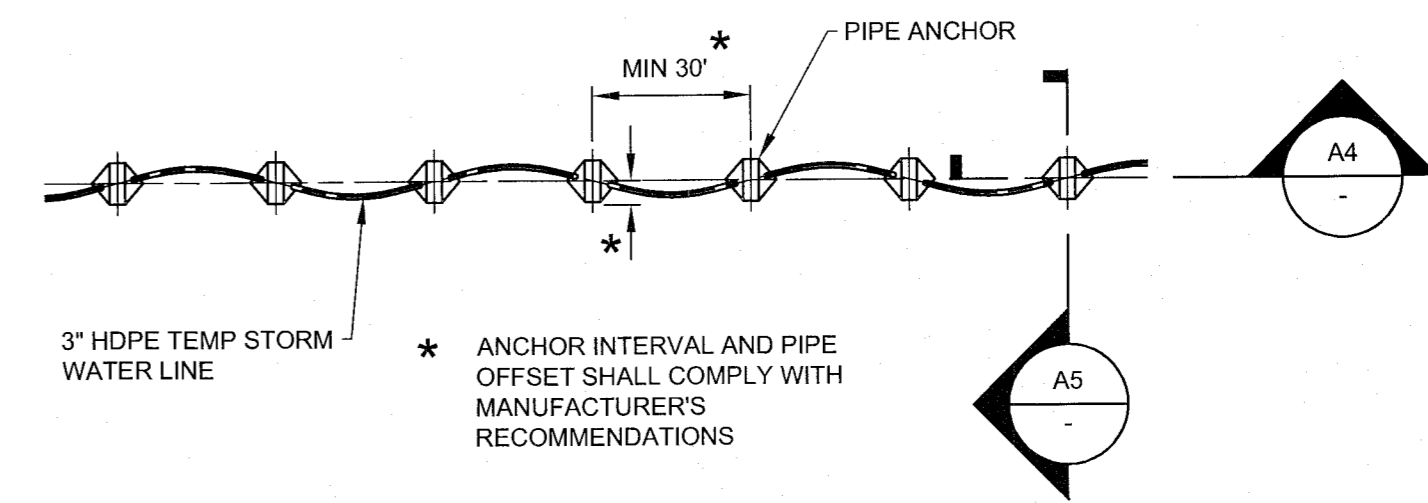
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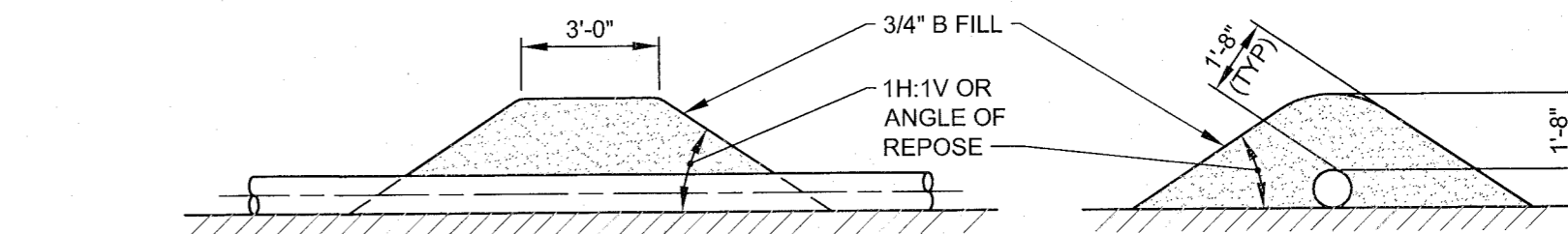
C1 SECTION
SCALE 1/2" = 1'



A1 SECTION
SCALE 1/2" = 1'



B4 PIPELINE ALIGNMENT FOR CONTRACTION/EXPANSION CONTROL
SCALE 1" = 40'



A4 SECTION
SCALE 1/4" = 1'

A5 SECTION
SCALE 1/4" = 1'

- NOTES**
- ALL DIMENSIONS AND ELEVATIONS ARE IN FEET/INCH.
 - UNLESS NOTED OTHERWISE, BEDDING UNDER PIPE SHALL BE MIN 6" THICK AND INITIAL BACKFILL ABOVE PIPE SHALL BE MIN 12" THICK.
 - WARNING TAPE SHALL BE AT 1'-6" DEEP, UNO.
 - FIBER OPTIC CABLES ARE SHOWN FOR SPACING/LOCATION REQUIREMENTS ONLY. SUPPLY/INSTALLATION IS NOT IN THE CIVIL WORKS SCOPE. SUPPLY/INSTALLATION BY OTHERS AS PER DRAWINGS T-002 AND EI-507.
 - ALL TRENCH/CUT SLOPES SHALL BE DONE PER OSHA REGULATIONS OR TEMPORARY SHORING IS TO BE PROVIDED.
 - DATUM IS NAVD88.
 - DIMENSIONS AND ELEVATIONS SHOWN ON SECTION C1 ARE FOR EFFLUENT PIPE (FE). FOR OTHER PIPES, DIMENSIONS VARY. CONTRACTOR SHALL VERIFY THE DIMENSIONS AND ELEVATIONS PRIOR TO ASSEMBLING PIPES AND FITTINGS.

US Army Corps of Engineers

DATE	DESCRIPTION	MARK
MAY 2018	ISSUED FOR CONSTRUCTION	0

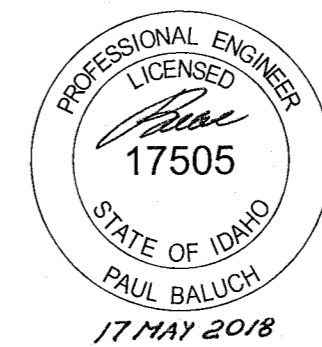
DATE	DESCRIPTION	MARK
MAY 2018	ISSUED FOR CONSTRUCTION	0

DESIGNED BY: **U.S. ARMY CORPS OF ENGINEERS**
 DRAWN BY: **SEATTLE DISTRICT**
 CHECKED BY: **SEATTLE DISTRICT**
 SUBMITTED BY: **amtec foster wheeler**
 PLOT SCALE: **1/2" = 1'**
 FILE NAME: **19043-700-DD10-UGD-431**
 FILE NUMBER: **19043-700-DD10-UGD-431**

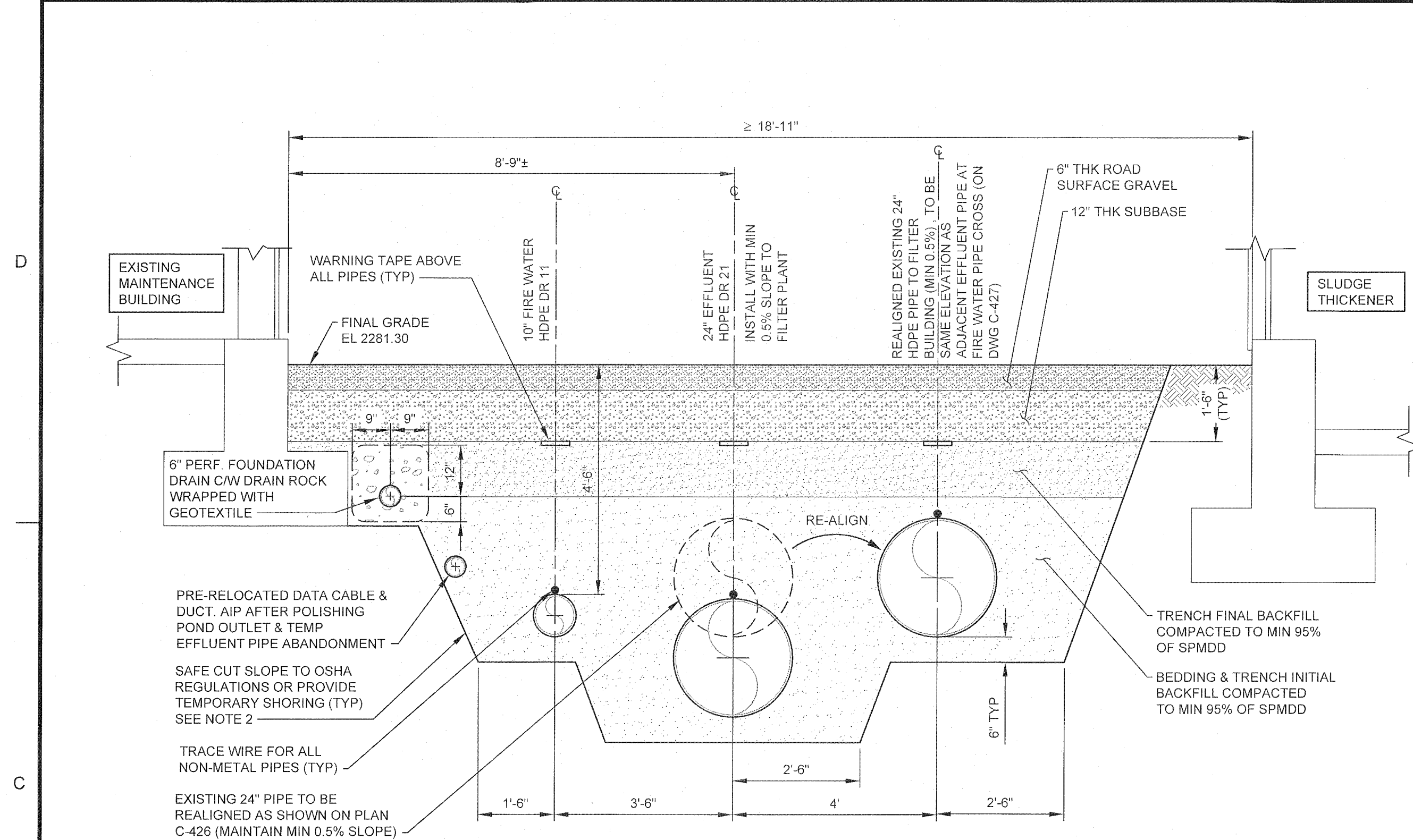
SEATTLE DISTRICT
amtec foster wheeler
751 ARBOR WAY SUITE 180,
BLUE BELL, PA 19422-1972

CIVIL
CTP BURIED AND OVERLAND UTILITIES
SECTIONS AND DETAILS - 2

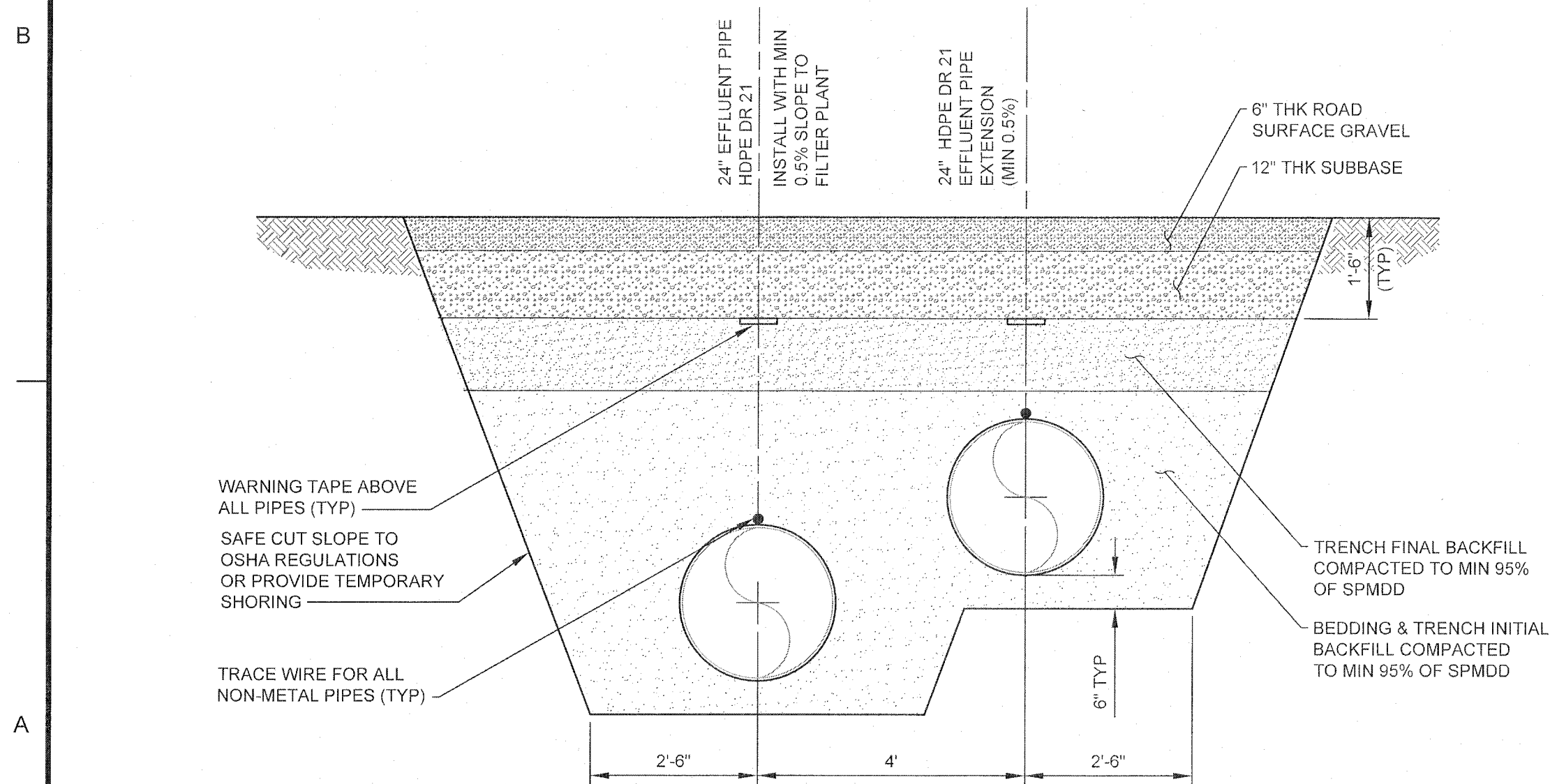
SHEET IDENTIFICATION
C-431
 SHEET 1 OF 1



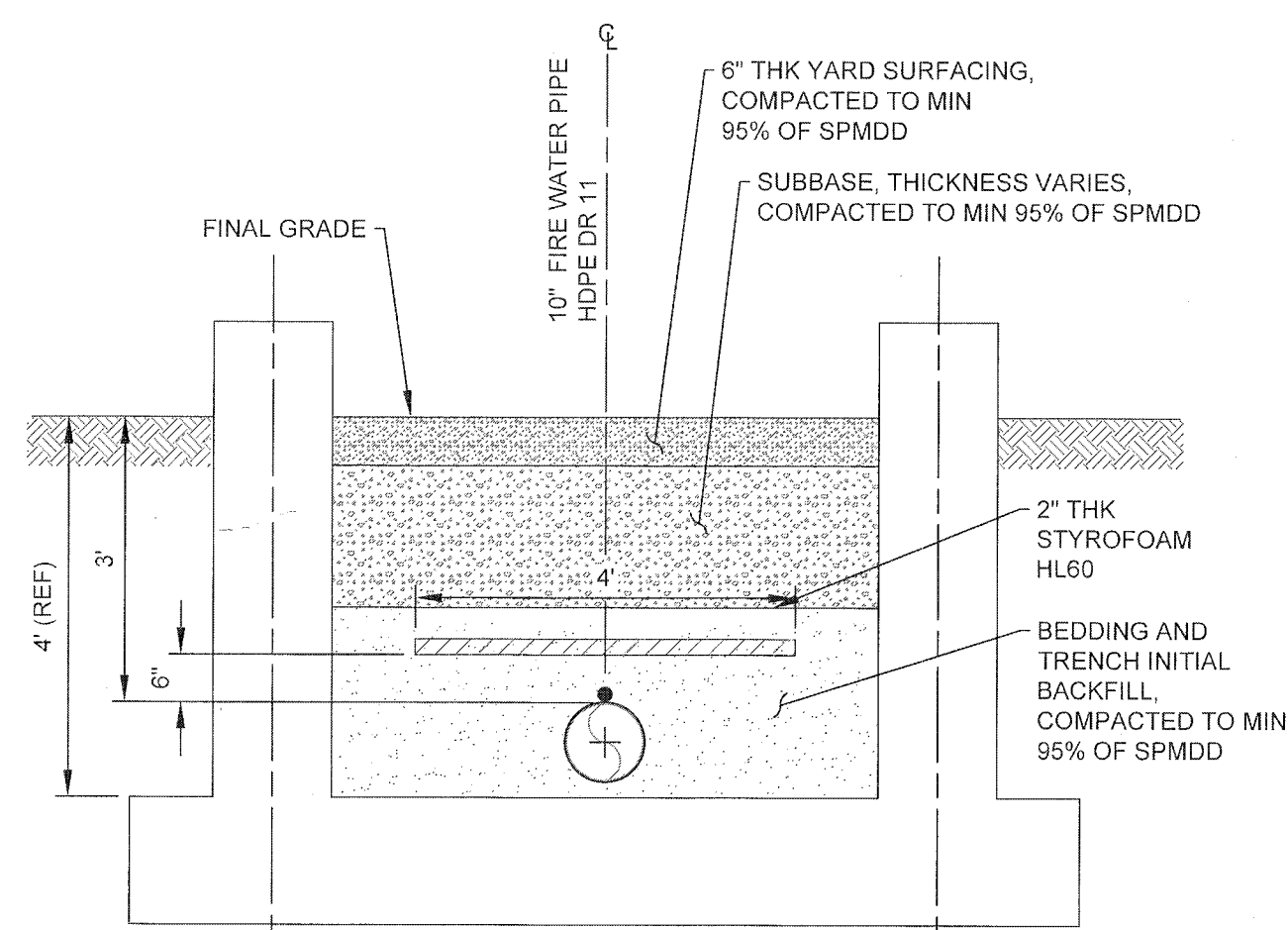
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DES	HD	20DEC17	
DRN	RS	20DEC17	
CHK	VM	5FEB18	
APP	PB	14MAY18	
REV	0	19043	
DRAWING NO.	PROJECT NO.		
19043-700-DD10-UGD-431	19043		



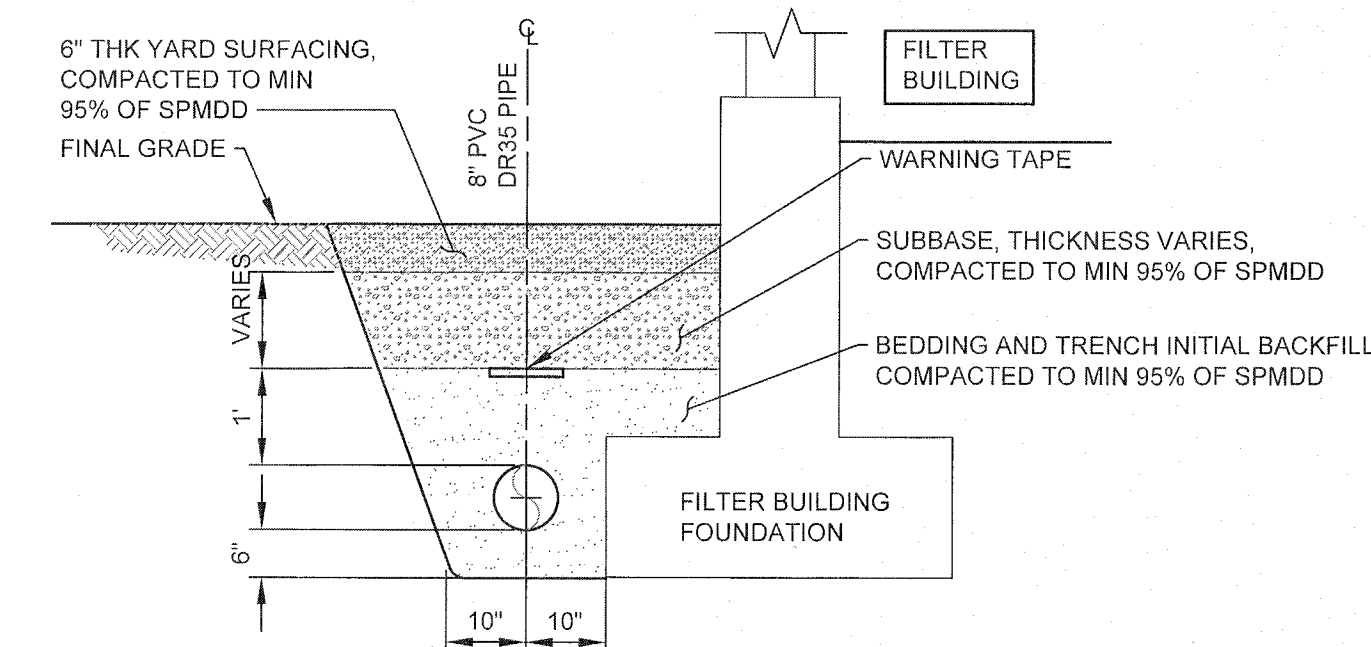
C1 SECTION
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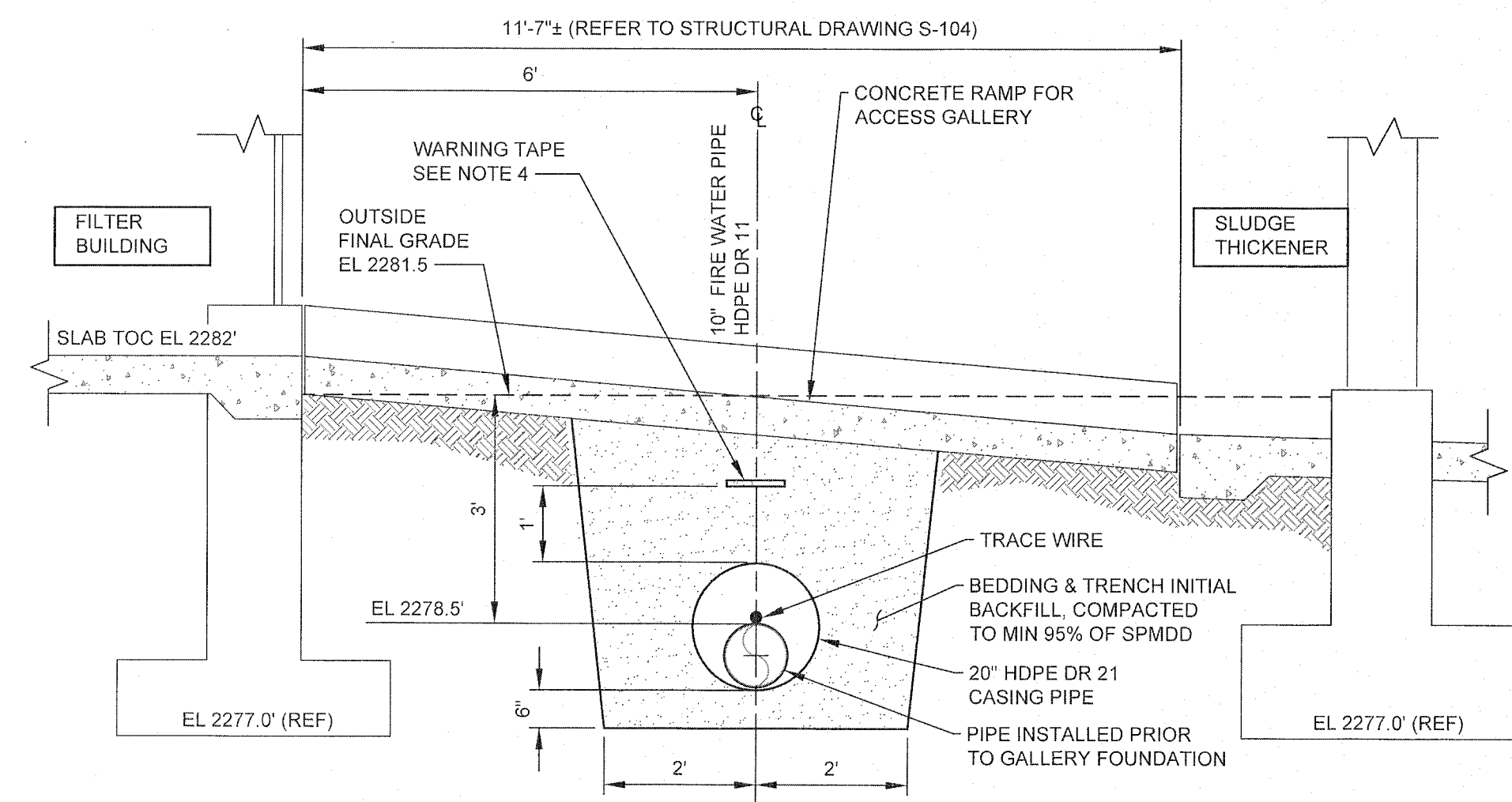
A1 SECTION
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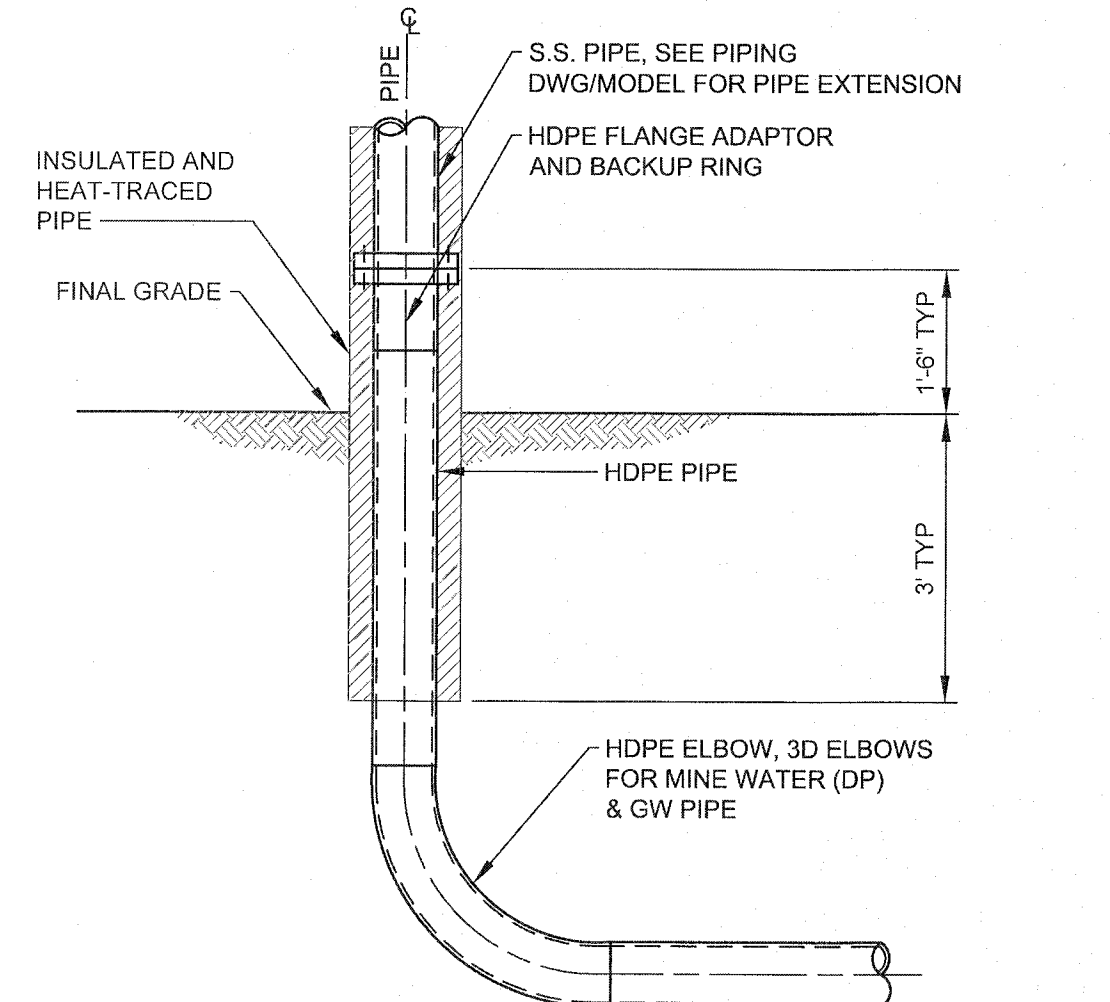
A3 SECTION
SCALE 1/2" = 1'



C4 SECTION - ROOF DRAIN
SCALE 1/2" = 1'



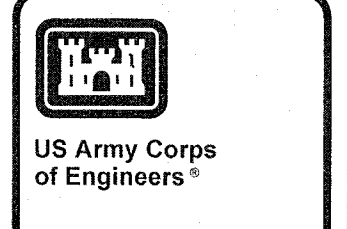
B4 SECTION
SCALE 1/2" = 1'



A4 SECTION - TYPICAL RISER TO PIPE RACK
SCALE 1/2" = 1'

NOTES

1. ALL DIMENSIONS AND ELEVATIONS ARE IN FEET/INCH.
2. PRIOR TO TRENCH EXCAVATION, CONTRACTOR SHALL HYDROVACUUM A TEST PIT NEAR FOUNDATION OF EXISTING MAINTENANCE BUILDING AND DECIDE IF SHORING IS REQUIRED.
3. UNLESS NOTED OTHERWISE, BEDDING UNDER PIPE SHALL BE MIN 6" THICK AND INITIAL BACKFILL ABOVE PIPE SHALL BE MIN 12" THICK.
4. WARNING TAPE SHALL BE AT 1'-6" DEEP, UNO.



DATE	DESCRIPTION	MARK	DATE	APPR
0	ISSUED FOR CONSTRUCTION		MAY 2018	

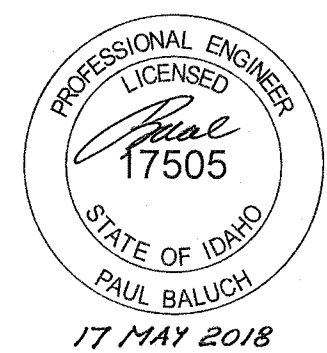
DESIGNED BY: H DU	CHECKED BY: R SAK-ALA	DATE: SEPTEMBER 2017	SUBMITTED BY: V MADALAZZO	DATE: FEBRUARY	FILE NAME: 194043-700-DD10-UGD-432
U.S. ARMY CORPS OF ENGINEERS SEATTLE DISTRICT SEATTLE, WASHINGTON					
amtec foster wheeler 75 ARBOR WAY SUITE 100 BLUE BELT PA 19422-1972					

CENTRAL TREATMENT PLANT UPGRADE AND GROUND WATER COLLECTION SYSTEM	CIVIL CTP BURIED AND OVERLAND UTILITIES SECTIONS AND DETAILS - 3
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SHEET IDENTIFICATION C-432	SHEET 1 OF 1
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DESIGNED BY RS	CHECKED BY VM	DATE 20DEC17
APP PB	DATE 14MAY18	
REV 0	PROJECT NO. 194043	

DRAWING NO. 194043-700-DD10-UGD-432



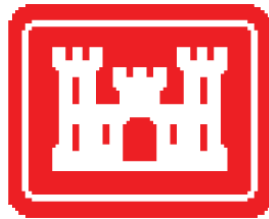
APPENDIX B

Design Package 4A Civil Work Specifications



**DP4A – CTP Civil Specifications
Bunker Hill Central Treatment Plant Upgrade Project
Kellogg, Idaho**

Prepared for:
**United States Army Corps of Engineers
Seattle District**



Prepared by:
**Amec Foster Wheeler Environment & Infrastructure, Inc.
751 Arbor Way, Suite 180
Blue Bell, PA 19422-1972**

SPECIFICATIONS

ISSUED FOR CONSTRUCTION

May 2018

Contract No. W912DW-16-C-0012


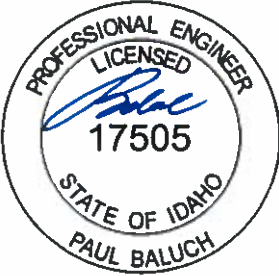
**DP4A – CTP Civil Specifications
Bunker Hill Central Treatment Plant Upgrade Project
Kellogg, Idaho**

May 2018

W912DW-16-C-0012

Prepared for:
**United States Army Corps of Engineers
Seattle District**

Issued for Construction

Prepared By:		<u>May 14, 2018</u>	<u>(604) 664-3199</u>
	Huachang (Hank) Du Civil Lead	Date	Phone Number
Reviewed By:		<u>16 MAY 2018</u>	<u>(604) 664-4668</u>
	Paul Baluch Civil Engineer	Date	Phone Number
Plan Approval:			<u>(406) 235-0247</u>
	Randy Huffsmith, PE Project Manager	Date	Phone Number
Plan Concurrence:			<u>(978) 467-5757</u>
	Eric Reitter, PE Design Quality Control Manager and Deputy Project Manager	Date	Phone Number

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CONTRACT NO.

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # PGRAPH	GOVT OR CLASSIFICATION REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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SECTION 02 41 00.04

DEMOLITION
05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K (2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 145 (1991; R 2012) Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

AASHTO T 180 (2017) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6 (2006) Safety Requirements for Demolition Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) Safety and Health Requirements Manual

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25 (Jun 2000; Reaffirmed Oct 2010) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders
<http://www.aviation.dla.mil/UserWeb/aviationengineering/>

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M (2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures

MIL-STD-129 (2014; Rev R) Military Marking for Shipment and Storage

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1

(2015; Rev L) Obstruction Marking and Lighting

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 82

Protection of Stratospheric Ozone

49 CFR 173.301

Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

1.2 PROJECT DESCRIPTION

1.2.1 Demolition Plan

The Demolition Subcontractor will prepare a Demolition Plan and submit proposed salvage, demolition, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Identify components and materials to be salvaged for reuse or recycling. Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use. This Demolition Plan will coordinate with the Demolition, Decommissioning, and Salvage Plan (GeoTek, January 2018) which is based on specification 01 79 19 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT. Both documents will be utilized in evaluating and executing handling/disposal of demolition materials.

1.2.2 General Requirements

Do not begin demolition until authorization is received from the Prime Contractor. The work of this section is to be performed in a manner that maximizes the value derived from the salvage and recycling of materials. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the buildings. The work includes demolition,, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from construction site daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Prime Contractor. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, or to be reused. Repair or replace damaged items as approved by the Prime Contractor. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload structural elements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Prime Contractor prior to performing such work.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

1.3.2 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

1.3.3 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Prime Contractor.

1.3.4 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Prime Contractor upon written request from the Contractor and disconnected and sealed by the Contractor.

1.3.5 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.5 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Demolition Plan; R

Existing Conditions

SD-11 Closeout Submittals

Receipts

1.6 QUALITY ASSURANCE

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in [ASSE/SAFE A10.6](#). Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

1.6.1 Dust and Debris Control

Prevent the spread of dust and debris to occupied portions of the building and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris.

1.7 PROTECTION

1.7.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Anchor barricades in a manner to prevent displacement by wind, jet or prop blast. Notify the Prime Contractor prior to beginning such work.

Provide a minimum of 2 FAA type L-810 steady burning red obstruction lights on temporary structures (including cranes) over [100 feet](#), but less than [100 ft](#), above ground level. The use of LED based obstruction lights are not permitted. For temporary structures (including cranes) over [200 ft](#) above ground level provide obstruction lighting in accordance with [FAA AC 70/7460-1](#). Light construction and installation shall comply with [FAA AC 70/7460-1](#). Lights shall be operational during periods of reduced visibility, darkness, and as directed by the Prime Contractor. Maintain the temporary services during the period of construction and remove only after permanent services have been installed and tested and are in operation.

1.7.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.8 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Prime Contractor.

1.9 EXISTING CONDITIONS

Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Prime Contractor showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.

PART 2 PRODUCTS

2.1 FILL MATERIAL

- a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill voids, depressions or excavations resulting from demolition of structures.
- b. Fill material shall conform to the definition of satisfactory soil material as defined in AASHTO M 145, Soil Classification Groups A-1, A-2-4, A-2-5 and A-3. In addition, fill material shall be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 2 inches in any dimension.
- c. Proposed fill material must be sampled and tested by an approved soil testing laboratory, as follows:

Soil classification	AASHTO M 145
Moisture-density relations	AASHTO T 180, Method B or D

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

3.1.1 Structures

- a. Remove existing structures as indicated on the Drawings.
- b. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or floor before the supporting members on the lower level are disturbed. Demolish concrete and masonry walls in small sections. Remove

structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods as approved by the Prime Contractor.

- c. Locate demolition and deconstruction equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

3.1.2 Utilities and Related Equipment

3.1.2.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Prime Contractor. Do not interrupt existing utilities serving facilities occupied and used by the plant except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.2.2 Disconnecting Existing Utilities

Remove existing utilities, as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Prime Contractor. When utility lines are encountered but are not indicated on the drawings, notify the Prime Contractor prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Prime Contractor.

3.1.3 Chain Link Fencing

Remove chain link fencing, gates and other related items scheduled for removal and transport to designated areas. Remove gates as whole units.

3.1.4 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

3.1.5 Structural Steel

Dismantle structural steel at field connections and in a manner that will prevent bending or damage. Salvage for recycle structural steel, steel joists, girders, angles, plates, columns and shapes. Do not use flame-cutting torches unless other dismantling methods are not practical. Transport steel joists and girders as whole units and not dismantled. Transport structural steel shapes to a designated storage area as directed by the Prime Contractor, stacked according to size, type of member and length, and stored off the ground, protected from the weather.

3.1.6 Miscellaneous Metal

Salvage shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, metal windows and similar items as whole units. Salvage light-gage and

cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Scrap metal shall become the Contractor's property. Recycle scrap metal as part of demolition and deconstruction operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.7 Carpentry

Salvage for recycle lumber, millwork items, and finished boards, and sort by type and size. Chip or shred and recycle salvaged wood unfit for reuse, except stained, painted, or treated wood. Brace the open end of door frames to prevent damage.

3.1.8 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

- a. Concrete and Masonry: Completely fill holes and depressions, caused by previous physical damage or left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.

3.1.9 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.1.10 Locksets on Swinging Doors

Remove all locksets from all swinging doors indicated to be removed and disposed of. Deliver the locksets and related items to a designated location for receipt by the Prime Contractor after removal.

3.1.11 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated storage area as directed by the Prime Contractor. Do not remove equipment until approved. Do not offer low-efficiency equipment for reuse.

3.1.11.1 Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; tanks, piping and

fixtures shall be drained; interiors, if previously used to store flammable, explosive, or other dangerous liquids, shall be steam cleaned. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.

3.1.11.2 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.1.11.3 Fixtures, Motors and Machines

Remove and salvage motors and machines as directed by Prime Contractor. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage. Classify broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise unserviceable as debris to be disposed of by the Contractor. Salvage and crush porcelain plumbing fixtures unsuitable for reuse.

3.1.12 Electrical Equipment and Fixtures

Salvage motors, motor controllers, and operating and control equipment that are attached to the driven equipment as directed by Prime Contractor. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.1.12.1 Electrical Fixtures

Salvage unprotected glassware from the fixture and salvage separately. Salvage incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification and protected from breakage.

3.1.12.2 Fixtures

Remove incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification, and protected from breakage.

3.1.12.3 Electrical Devices

Remove and salvage switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items as directed by Prime Contractor. Box and tag these items

for identification according to type and size.

3.1.12.4 Wiring Ducts or Troughs

Remove and salvage wiring ducts or troughs as directed by Prime Contractor. Dismantle plug-in ducts and wiring troughs into unit lengths. Remove plug-in or disconnecting devices from the busway and store separately.

3.1.12.5 Conduit and Miscellaneous Items

Salvage conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports, knobs, tubes, cleats, and straps as debris to be removed and disposed.

3.1.13 Hoists

Remove hoists and similar conveying equipment and salvage as whole units, to the most practical extent. Remove and prepare items for salvage without damage to any of the various parts.

3.1.14 Items With Unique/Regulated Disposal Requirements

Unique/Regulated disposal requirements of demolition materials are addressed in the Demolition, Decommissioning, and Salvage Plan (GeoTek, January 2018) and Demolition Plan (Demolition Subcontractor).

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from site. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Prime Contractor. The Prime Contractor will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment indicated on the Drawings to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.3.3 Salvaged Materials and Equipment

- a. Salvage items and material to the maximum extent possible.

- b. Store all materials salvaged for the Contractor as approved by the Prime Contractor and remove from site before completion of the contract. On site sales of salvaged material is prohibited.
- c. Remove salvaged items in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage must be repaired or replaced to match existing items. Properly identify the contents of containers.
- d. Remove historical items in a manner to prevent damage if encountered on site. Deliver the following historical items to the Prime Contractor for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.
- e. Remove and capture all Class I ODS refrigerants in accordance with the Clean Air Act Amendment of 1990.

3.3.4 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting [AHRI Guideline K](#) suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from site and disposed of in accordance with [40 CFR 82](#). Products, equipment and appliances containing ODS in a sealed, self-contained system shall be disposed of in accordance with [40 CFR 82](#). Submit [Receipts](#) or bills of lading, as specified.

3.3.4.1 Special Instructions

No more than one type of ODS is permitted in each container. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

- a. Activity name and unit identification code
- b. Activity point of contact and phone number
- c. Type of ODS and pounds of ODS contained
- d. Date of shipment
- e. National stock number (for information, call (804) 279-4525).

3.3.4.2 Fire Suppression Containers

Deactivate fire suppression system cylinders and canisters with electrical charges or initiators prior to shipment. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.3.5 Transportation Guidance

Ship all ODS containers in accordance with [MIL-STD-129](#), [DLA 4145.25](#) (also

referenced one of the following: Army Regulation 700-68, 49 CFR 173.301, and DOD 4000.25-1-M.

3.3.6 Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable combustible material off the site.

3.4 CLEANUP

Remove debris and rubbish and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations off site with all applicable federal, state and local regulations. Storage of removed materials on the project site is prohibited.

3.5.2 Burning On-Site

Burning of materials removed from demolished and deconstructed structures will not be permitted.

3.5.3 Removal to Spoil Areas

Transport noncombustible materials removed from demolition and deconstruction structures to designated spoil areas as directed by Prime Contractor.

3.5.4 Removal from Site

Transport waste materials removed from demolished structures, except waste soil, from on site for legal disposal. Dispose of waste soil as directed.

3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

SECTION 31 00 00.04

EARTHWORK
08/08

PART 1 GENERAL

1.1 CRITERIA FOR BIDDING

Base bids on the following criteria:

- a. Surface elevations are as indicated.
- b. Pipes or other artificial obstructions, except those indicated, will not be encountered.
- c. Ground water elevations indicated by the boring log were those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
- d. Material character is indicated by the boring logs.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 180 (2015) Standard Method of Test for
Moisture-Density Relations of Soils Using
a 4.54-kg (10-lb) Rammer and a 457-mm
(18-in.) Drop

AASHTO T 224 (2010) Standard Method of Test for
Correction for Coarse Particles in the
Soil Compaction Test

ASTM INTERNATIONAL (ASTM)

ASTM C136/C136M (2014) Standard Test Method for Sieve
Analysis of Fine and Coarse Aggregates

ASTM D1140 (2014) Amount of Material in Soils Finer
than the No. 200 (75-micrometer) Sieve

ASTM D1556/D1556M (2015; E 2016) Standard Test Method for
Density and Unit Weight of Soil in Place
by Sand-Cone Method

ASTM D1557 (2012; E 2015) Standard Test Methods for
Laboratory Compaction Characteristics of
Soil Using Modified Effort (56,000
ft-lbf/ft³) (2700 kN-m/m³)

ASTM D2487	(2011) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D422	(1963; R 2007; E 2014; E 2014) Particle-Size Analysis of Soils
ASTM D4318	(2010; E 2014) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	(2017) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D698	(2012; E 2014; E 2015) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

1.3 DEFINITIONS

1.3.1 Satisfactory Materials

Satisfactory materials comprise any materials classified by ASTM D2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SP-SM,. Satisfactory materials shall be free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

1.3.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.

1.3.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with ASTM D4318, ASTM C136/C136M and ASTM D1140.

1.3.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D698 abbreviated as a percent of laboratory maximum density. Since ASTM D698 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180 and corrected with AASHTO T 224. To maintain the same percentage of coarse

material, use the "remove and replace" procedure as described in NOTE 8 of Paragraph 7.2 in [AASHTO T 180](#).

1.3.5 Topsoil

Material suitable for topsoils obtained from offsite areas is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than [one inch](#) diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.3.6 Hard/Unyielding Materials

Hard/Unyielding materials comprise weathered rock, dense consolidated deposits, or conglomerate materials which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.3.7 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding [1 cubic yard](#) in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.3.8 Unstable Material

Unstable materials are too wet to properly support the utility pipe, conduit, or appurtenant structure.

1.3.9 Select Granular Material

1.3.9.1 General Requirements

Select granular material consist of materials classified as GW, GP, SW, SP, by [ASTM D2487](#) where indicated.

1.3.10 Initial Backfill Material

Initial backfill consists of select granular material or satisfactory materials. The maximum particle size shall be limited to [1/2-inch](#) for HDPE pipes to [4 inches](#) in diameter, [3/4-inch](#) for pipes [6 inches](#) to [8 inches](#) in diameter, [1-inch](#) for pipes [10 inches](#) to [16 inches](#) indiameter, and [1-1/2-inches](#) for larger pipes.

1.3.11 Expansive Soils

Expansive soils are defined as soils that have a plasticity index equal to or greater than 25 when tested in accordance with [ASTM D4318](#).

1.3.12 Nonfrost Susceptible (NFS) Material

Nonfrost susceptible material are a uniformly graded washed sand with a maximum particle size of [2 inches](#) and less than 5 percent passing the [No. 200](#) size sieve, and with not more than 3 percent by weight finer than 0.02

mm grain size.

1.3.13 Quarry Spalls

The 4-inch to 8-inch quarry spalls shall meet the following gradation requirements:

Screen/Sieve Size	Percent Passing (by weight)
8-inch	100
3-inch	0-40
3/4-inch	0-10

1.3.14 Rock Cap

The 1-inch to 3-inch Class I (rock cap) materials shall meet Idaho Transportation Department, Standard Specifications for Highway Construction, Tables 703.08-1 Aggregate Gradation Requirements and Table 703.08-2 Aggregate Criteria.

1.3.15 Aggregate 3/4-inch B

The aggregate 3/4-inch B material shall meet Idaho Transportation Department, Standard Specifications for Highway Construction, Tables 703.04-1, Nominal Maximum Size, and Aggregate Criteria, Table 703.04-2.

1.3.16 Washed Pea Gravel

The washed pea gravel shall be rounded gravel and meet the following gradation requirements:

Screen/Sieve Size	Percent Passing (by weight)
1-inch	99-100
3/4-inch	80-100
3/8-inch	0-40
No. 4	0-4
No. 200	0-2

1.3.17 Structural Fill

The structural fill material shall meet Idaho Transportation Department, Standard Specifications for Highway Construction, Tables 703.04-1 Nominal Maximum Size, 3/4-inch B passing, except deleting 1-inch 100 percent passing requirement and adding 3-inch 100 percent passing requirement, and Aggregate Criteria, Table 703.04-2.

Bunker Hill - CTP Upgrades

1.3.18 Subbase

The subbase course for yard surfacing shall meet Idaho Transportation Department, Standard Specifications for Highway Construction, Tables 703.11-1, Nominal Maximum Size, 3/4-inch B passing, except deleting 1-inch 100 percent passing requirement and adding 3-inch 100 percent passing requirement, and Aggregate Criteria, Table 703.11-2.

1.4 SYSTEM DESCRIPTION

1.4.1 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

1.5 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Dewatering Work Plan; R

SD-03 Product Data

Utilization of Excavated Materials; R
Opening of any Excavation or Borrow Pit

SD-06 Test Reports

Testing

Borrow Site Testing

Within 24 hours of conclusion of physical tests, submit one copy of test results, including calibration curves and results of calibration tests.

SD-07 Certificates

Testing

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR OFFSITE SOILS

Borrow or fill material samples shall be collected and analyzed according to the Contractor's project specific Specifications, but also at the following minimums:

Material Use or Location	Test Description	Test Method	Frequency
Fill under the area of influence of structures or pavements or in water-holding embankments	Grain Size Analysis (1)	ASTM D422	1 per 2000 CY imported manufactured source. 1 per 500 CY for select on-site borrow.
	As-compacted moisture/density	ASTM D6938	1 per lift per 200 CY and at least 1 per shift per piece of compacting equipment.
Trench and pipe zone backfill	Grain Size Analysis (1)	ASTM D422	1 per 1000 CY imported manufactured source. 1 per 500 CY for select on-site borrow.
	Modified Proctor Compaction (1)	ASTM D1557	1 per 1000 CY
	As-compacted moisture/density	ASTM D6938	1 per lift per 200 LF of trench and at least 1 per shift per piece of compacting equipment.

Provide Borrow Site Testing from a composite sample of material from the borrow site, with at least one test from each borrow site.

2.2 BURIED WARNING AND IDENTIFICATION TAPE

Provide acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inches minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Provide permanent color and printing, unaffected by moisture or soil.

Warning Tape Color Codes	
Red	Electric
Yellow	Gas, Oil; Dangerous Materials
Orange	Telephone and Other Communications
Blue	Water Systems
Green	Sewer Systems

2.3 DETECTION WIRE FOR NON-METALLIC PIPING

Insulate a single strand, solid copper detection wire with a minimum of 12 AWG.

2.4 MATERIAL FOR RIP-RAP

2.4.1 Bedding Material

Provide bedding material consisting of sand, gravel, or crushed rock, well graded, with a maximum particle size same as initial backfill. Compose material of tough, durable particles. Allow fines passing the No. 200 standard sieve with a plasticity index less than six.

2.4.2 Grout

Provide durable grout composed of cement, water, an air-entraining admixture, and sand mixed in proportions of one part portland cement to two parts of sand, sufficient water to produce a workable mixture, and an amount of admixture which will entrain sufficient air, as determined by the Contracting Officer. Mix grout in a concrete mixer. Allow a sufficient mixing time to produce a mixture having a consistency permitting gravity flow into the interstices of the rip-rap with limited spading and brooming.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where grass exists on ground surface, strip surface layer to a depth of 4 inches. Transport stripped soil to designated waste disposal or spoil areas.

3.2 GENERAL EXCAVATION

Perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Perform the grading in accordance with the typical sections shown and the tolerances specified in paragraph FINISHING. Transport satisfactory excavated materials and backfill in utility trench or temporarily store at designated area on site for future use. Excavate unsatisfactory materials encountered within the limits of the work below grade and transport to designated waste disposal or spoil areas.

3.2.1 Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. Do not permit French drains, sumps, ditches or trenches within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Take control measures by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, maintain the water level continuously, at least 1 foot below the working level. Operate dewatering system continuously until construction work below existing water levels is complete. Submit performance records weekly. Measure and record performance of dewatering system at same time each day by use of observation wells or piezometers installed in conjunction with the dewatering system. Water from dewatering will be pumped to the existing

Central Treatment Plant for treatment and discharge, or other means approved by the Contracting Officer.

3.2.2 Trench Excavation Requirements

Excavate the trench as the typical trench sections or details. Shore trench walls more than 4 feet high, cut back to a stable slope, or provide with equivalent means of protection for employees who may be exposed to moving ground or cave in. Excavate trench walls which are cut back to at least the angle of repose of the soil. Give special attention to slopes which may be adversely affected by weather or moisture content. Do not exceed the trench width below the pipe top of 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter, and do not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter.

3.2.2.1 Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Excavate bell holes to the necessary size at each joint or coupling to eliminate point bearing. Remove stones of 4 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, to avoid point bearing.

3.2.2.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, remove such material 4 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

3.2.2.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, remove such material to the depth directed and replace it to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the Prime Contractor.

3.2.2.4 Excavation for Appurtenances

Provide excavation for valves, sumps, chambers, inlets, or similar structures sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. Clean rock or loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Remove loose disintegrated rock and thin strata.

3.2.3 Underground Utilities

The Contractor is responsible for movement of construction machinery and equipment over pipes and utilities during construction. Perform work adjacent to non-Government utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within 2 feet of known Government-owned utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand

or by hydrovacuum. Start excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

3.3 SELECTION OF BORROW MATERIAL

Select borrow material to meet the requirements and conditions of the particular fill for which it is to be used. Obtain borrow material from the borrow areas within the limits of the project site or from approved private sources. Unless otherwise provided in the contract, the Contractor is responsible for obtaining the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling from the owners. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, do not obtain borrow within the limits of the project site without prior written approval. Consider necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

Notify the Contracting Officer sufficiently in advance of the opening of any excavation or borrow pit or borrow areas to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, excavate borrow pits and other excavation areas providing adequate drainage. Transport overburden and other spoil material to designated spoil areas or otherwise dispose of as directed. Provide neatly trimmed and drained borrow pits after the excavation is completed. Ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.5 BACKFILL

Do not place material on surfaces that are muddy, frozen, or contain frost. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Moisten material as necessary to plus or minus 2 percent of optimum moisture to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

3.6 UTILIZATION OF EXCAVATED MATERIALS

Dispose unsatisfactory materials removing from excavations into designated waste disposal or spoil areas. Use satisfactory material removed from excavations, insofar as practicable, in the construction of fills, bedding (as backfill), and for similar purposes. Submit procedure and location for disposal of unused satisfactory material. Submit proposed source of borrow material. Do not waste any satisfactory excavated material without specific written authorization. Dispose of satisfactory material, authorized to be wasted, in designated areas approved for surplus material storage or designated waste areas as directed. Stockpile and use coarse rock from excavations for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. Do not dispose excavated material to obstruct the flow of any

stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

3.7 BURIED TAPE AND DETECTION WIRE

3.7.1 Buried Warning and Identification Tape

Provide buried utility lines with utility identification tape. Bury tape **12 inches** below finished grade.

3.7.2 Buried Detection Wire

Install detection wire (tracing wire) on the top of non-metallic pipes. The detection wire shall run the whole length of the pipe. Attach the wire to the top of new pipe with plastic tape at **6-foot** intervals, and terminate in valve pit or end of pipe. Install a minimum **2-foot** long, **3-inch** Diameter DP2 PVC conduit to ground surface in non-traffic area. Loosely laid **1-foot** extra length in the conduit, and cap the conduit at the top. Use 14 GA solid copper wire that is underground rated with **0.03-inch** green polyethylene coating.

3.8 BACKFILLING AND COMPACTION

Place backfill adjacent to any and all types of structures, in successive horizontal layers of loose materia not more than **8 inches** in depth. Compact to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials, to prevent wedging action or eccentric loading upon or against the structure. Backfill material must be within the range of -2 to +2 percent of optimum moisture content at the time of compaction.

3.8.1 Trench Backfill

Backfill trenches to the grade shown. Backfill the trench to **2 feet** above the top of pipe prior to performing the required pressure tests. Leave the joints and couplings uncovered during the pressure test. Do not backfill the trench until all specified tests are performed.

3.8.1.1 Replacement of Unyielding Material

Replace unyielding material removed from the bottom of the trench with select granular material or initial backfill material.

3.8.1.2 Replacement of Unstable Material

Replace unstable material removed from the bottom of the trench or excavation with select granular material placed in layers not exceeding **6 inches** loose thickness.

3.8.1.3 Bedding and Initial Backfill

Place initial backfill material and compact it with approved tampers to a height of at least **one foot** above the utility pipe or conduit. Bring up the backfill evenly on both sides of the pipe for the full length of the pipe. Take care to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping as specified herein. Compact backfill to top of pipe to 95 percent of **ASTM D698** maximum

density. Provide plastic piping with bedding to spring line of pipe. Provide materials as follows:

3.8.1.3.1 Sand

Clean, coarse-grained sand classified as SW by [ASTM D2487](#) for bedding. Use sand for electrical conduits only. The maximum particle size shall be limited to [3/8-inch](#).

3.8.1.3.2 Gravel and Crushed Stone

Clean, coarsely graded natural gravel, crushed stone or a combination thereof identified GW in accordance with [ASTM D2487](#) for bedding. The maximum particle size shall be limited to [1/2-inch](#) for HDPE pipe to [4 inches](#) in diameter, [3/4-inch](#) for pipes [6 inches](#) to [8 inches](#) in diameter, [1-inch](#) for pipes [10 inches](#) to [16 inches](#) in diameter, and [1-1/2-inches](#) for larger pipes. Gravel and crushed stone are used for HDPE pipe only, not for electrical conduits.

3.8.1.4 Final Backfill

Fill the remainder of the trench, except for special materials for roadways, railroads and airfields, with satisfactory material. Place backfill material and compact as follows:

3.8.1.4.1 Roadways and Traffic Areas

Place backfill up to the top of original subgrade and compact to 95 percent maximum density. Reinstall the surfacing layers of road and traffic area and compact the surfacing layers to 98 percent maximum density. Do not permit water flooding or jetting methods of compaction.

3.8.1.4.2 Other

Deposit backfill in layers of a maximum of [8 inches](#) loose thickness, and compact it to 95 percent maximum density. Do not permit compaction by water flooding or jetting. Apply this requirement to all other areas not specifically designated above.

3.8.2 Backfill for Appurtenances

After the [valves, sumps, chambers](#), inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, place backfill in such a manner that the structure is not be damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.9 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.9.1 Crossing Existing Gas Pipe

Contact the gas company to notify the date of construction and inquire emergency handling procedure and contact information. Minimize trench width and disturbance to existing gas pipe and its surrounding. Provide vertical clearance at least [12 inches](#).

3.9.2 Water Lines

Unless indicated otherwise, excavate trenches to a depth that provides a minimum cover of 3 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

3.10 TESTING

Perform testing by a Corps validated commercial testing laboratory or the Contractor's validated testing facility. Submit qualifications of the Corps validated commercial testing laboratory or the Contractor's validated testing facilities. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, Corps validated and approved by the Contracting Officer.

- a. Determine field in-place density in accordance with ASTM D6938. When ASTM D6938 is used, check the calibration curves and adjust using only the sand cone method as described in ASTM D1556/D1556M. ASTM D6938 results in a wet unit weight of soil in determining the moisture content of the soil when using this method.
- b. Check the calibration curves furnished with the moisture gauges along with density calibration checks as described in ASTM D6938; check the calibration of both the density and moisture gauges at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, remove the material, replace and recompact to meet specification requirements.
- c. Perform tests on recompacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.10.1 Fill and Backfill Material Gradation

One test per 500 cubic yards stockpiled or in-place source material. Determine gradation of fill and backfill material in accordance with ASTM C136/C136M.

3.10.2 In-Place Densities

- a. One test per 100 cubic yards, or fraction thereof, of each lift of fill or backfill.

3.10.3 Moisture Contents

In the stockpile, excavation, or borrow areas, perform a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. During unstable weather, perform tests as dictated by local conditions and approved by the Contracting Officer.

3.10.4 Optimum Moisture and Laboratory Maximum Density

Perform tests for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.11 DISPOSITION OF SURPLUS MATERIAL

Remove surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber to a location approved by the Contracting Officer.

-- End of Section --

SECTION 31 32 11.04

SOIL SURFACE EROSION CONTROL

08/08

PART 1 GENERAL

1.1 SUMMARY

The work consists of furnishing and installing temporary and permanent soil surface erosion control materials to prevent the pollution of air, water, and land, including fine grading, blanketing, stapling, mulching, vegetative measures, structural measures, and miscellaneous related work, within project limits and in areas outside the project limits where the soil surface is disturbed from work under this contract at the designated locations. This work includes all necessary materials, labor, supervision and equipment for installation of a complete system. Coordinate this section with the requirements of Section 31 00 00.04 EARTHWORK.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D1777	(1996; E 2011; R 2011) Thickness of Textile Materials
ASTM D3776/D3776M	(2009a; R 2013) Standard Test Method for Mass Per Unit Area (Weight) of Fabric
ASTM D3787	(2016) Bursting Strength of Textiles - Constant-Rate-of-Traverse (CRT), Ball Burst Test
ASTM D3884	(2009; R 2013; E 2014) Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)
ASTM D4355/D4355M	(2014) Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus
ASTM D4491/D4491M	(2015) Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D4533/D4533M	(2015) Standard Test Method for Trapezoid Tearing Strength of Geotextiles
ASTM D4632/D4632M	(2015a) Grab Breaking Load and Elongation of Geotextiles
ASTM D4751	(2016) Standard Test Method for Determining Apparent Opening Size of a

Geotextile

ASTM D4833/D4833M

(2007; E 2013; R 2013) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

ASTM D5852

(2000; R 2007; E 2014) Standard Test Method for Erodibility Determination of Soil in the Field or in the Laboratory by the Jet Index Method

ASTM D6629

(2001; E 2012; R 2012) Selection of Methods for Estimating Soil Loss by Erosion

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BD+C

(2009; R 2010) Leadership in Energy and Environmental Design(tm) Building Design and Construction (LEED-NC)

LEED GBDC Ref Guide

(2009; R 2010) LEED Reference Guide for Green Building Design, Construction and Major Renovations of Commercial and Institutional Buildings including Core & Shell and K-12 Projects

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Maintenance Record

SD-03 Product Data

Local/Regional Materials; (LEED BD+C)
Biobased Materials

Erosion Control Blankets

Submit manufacturer's literature including physical characteristics, application and installation instructions. Documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

SD-04 Samples

In addition to the samples, submit certification of recycled content or Statement of recycled content. Also submit certification of origin including the name, address and telephone number of manufacturer.

Mulch

2 pounds

Geotextile Fabrics

6 inch square

Erosion Control Blankets

6 inch square

SD-06 Test Reports

Geotextile Fabrics

Erosion Control Blankets

SD-07 Certificates

Mulch

Geotextile Fabrics

Installer's Qualification

SD-10 Operation and Maintenance Data

Maintenance Instructions

1.4 QUALITY ASSURANCE

1.4.1 Installer's Qualification

The installer shall be certified by the manufacturer for training and experience installing the material. Submit the installer's company name and address, and/or certification.

1.4.2 Erosion Potential

Assess potential effects of soil management practices on soil loss in accordance with [ASTM D6629](#). Assess erodibility of soil with dominant soil structure less than 2.8 to 3.1 inches in accordance with [ASTM D5852](#).

1.4.3 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

1.4.4 SUSTAINABLE DESIGN REQUIREMENTS

1.4.4.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources. Submit LEED documentation relative to local/regional materials credit in accordance with [LEED GBDC Ref Guide](#). Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

1.4.4.2 Biobased Materials

Use biobased materials when feasible and as specified. Submit

documentation indicating type of biobased material in product and biobased content.

PART 2 PRODUCTS

2.1 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.1.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.1.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.2 GEOTEXTILE FABRICS

Geotextile fabrics shall be woven of polypropylene filaments formed into a stable network so that the filaments retain their relative position to each other. Sewn seams shall have strength equal to or greater than the geotextile itself. Install fabric to withstand maximum velocity flows as recommended by the manufacturer. The geotextile shall conform to the following minimum average roll values:

Property	Performance	Test Method
Weight	264 g/m ²	ASTM D3776/D3776M
Thickness	0.635 mm	ASTM D1777
Permeability	0.12 cm/sec	ASTM D4491/D4491M
Abrasion Resistance, Type (percent strength retained)	58 percent X 81 percent	ASTM D3884
Tensile Grab Strength	1467 N X 1933 N	ASTM D4632/D4632M
Grab Elongation	15 percent X 20 percent	ASTM D4632/D4632M
Burst Strength	5510 kN/m ²	ASTM D3787
Puncture Strength	733 N	ASTM D4833/D4833M
Trapezoid Tear	533 N X 533 N	ASTM D4533/D4533M
Apparent Opening Size	40 US Std Sieve	ASTM D4751
UV Resistance @ 500 hours	90 percent	ASTM D4355/D4355M

2.3 EROSION CONTROL BLANKETS

2.3.1 Erosion Control Blankets Type II

Erosion control blankets shall be a machine-produced mat of 100 percent straw. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. Cover the blanket on the top side with a polypropylene netting having an approximate 1/2 by 1/2 inch mesh with photodegradable accelerators to provide breakdown of the netting within approximately 45 days, depending upon geographic location and elevation. Sew the blanket together on a maximum 1.5 inch centers with degradable thread. The erosion control blanket shall have the following properties:

Material Content	
Straw	100 percent with approximately 0.50 lb/yd ² weight
Netting	One side only, lightweight photodegradable with photo accelerators and approximately 1.64 lb/1,000 ft ² weight
Thread	Degradable
Note 1: Photodegradable life a minimum of 10 months with a minimum 90 percent light penetration. Apply to slopes up to a maximum 3:1 gradient.	

2.3.2 Erosion Control Blankets Type III

Type III blankets shall be used for erosion control and vegetation establishment on roadside embankments, abutments, berms, shoulders, and median swales where natural vegetation will provide long term stabilization. Erosion control blanket shall be a machine-produced mat consisting of 70 percent straw and 30 percent coconut fiber. The blanket shall be of consistent thickness with the straw and coconut fiber evenly distributed over the entire area of the mat. Cover the blanket on the top side with heavyweight photodegradable polypropylene netting having UV additives to delay breakdown and an approximate 5/8 by 5/8 inch mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate 1/2 by 1/2 inch mesh. Sew the blanket together on 1.5 inch centers with degradable thread. The erosion control blanket shall have the following properties:

Material Content	
Straw	70 percent by approximately 0.35 lb/yd ²
Coconut Fiber	30 percent by approximately 0.15 lb/yd ² weight
Netting	Top side heavyweight photodegradable with UV additives and approximately 3 lb/1,000 ft ² weight
	Bottom side lightweight photodegradable with approximately 1.64 lb/1,000 ft ² weight

Material Content	
NOTE: Photodegradable life a minimum of 10 months with a minimum 90 percent light penetration. Apply to slopes with a gradient less than 1.5:1.	

2.3.3 Erosion Control Blankets Type V

Erosion control blanket shall be a machine-produced mat of 100 percent straw. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. Cover the blanket on the top side with polypropylene netting having an approximate 1/2 by 1/2 inch mesh with photodegradable accelerators to provide breakdown of the netting within approximately 45 days, depending upon geographic location and elevation. Cover the bottom with a polypropylene netting having an approximate 1/2 by 1/2 inch mesh with photo accelerators. Sew the blanket together on 1.5 inch centers with degradable thread. The erosion control blanket shall have the following properties:

Material Content	
Straw	70 percent by approximately 0.35 lb/yd ²
Netting	Top side lightweight photodegradable with photo accelerators with approximately 1.64 lb/1,000 ft ² weight
	Bottom side lightweight photodegradable with photo accelerators and approximately 1.64 lb/1,000 ft ² weight
NOTE: Photodegradable life a minimum of 10 months with a minimum 90 percent light penetration. Apply to slopes up to a maximum 2:1 gradient.	

2.3.4 Erosion Control Blankets Type VI

Erosion control blanket shall be a machine-produced 100 percent biodegradable mat with a 100 percent straw fiber matrix. The blanket shall be of consistent thickness with the straw fiber evenly distributed over the entire area of the mat. Cover the blanket on the top side with a 100 percent biodegradable woven natural organic fiber netting. The netting shall consist of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine strands (commonly referred to as a Leno weave) to form an approximate 1/2 by 1/2 inch mesh. Sew the blanket together with biodegradable thread on 1.5 inch centers. The erosion control blanket shall have the following properties:

Material Content	
Matrix	100 percent straw fiber with approximately 0.50 lb/yd ² weight
Netting	One side only, Leno woven 100 percent biodegradable natural organic fiber

Material Content	
Weight	approximately 9.3 lb/1,000 ft
Thread	Biodegradable
NOTE: Photodegradable life a minimum of 10 months with a minimum 90 Percent light penetration. Apply to slopes up to a maximum 2:1 gradient.	

PART 3 EXECUTION

3.1 WEATHER CONDITIONS

Perform erosion control operations under favorable weather conditions; when excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped as directed. When special conditions warrant a variance to earthwork operations, submit a revised construction schedule for approval. Do not apply erosion control materials in adverse weather conditions which could affect their performance.

3.1.1 Finished Grade

Provide condition of finish grade status prior to installation, location of underground utilities and facilities. Verify that finished grades are as indicated on the drawings; complete finish grading and compaction in accordance with Section 31 00 00.04 EARTHWORK, prior to the commencement of the work. Verify and mark the location of underground utilities and facilities in the area of the work. Repair damage to underground utilities and facilities at the Contractor's expense.

3.1.2 Placement of Erosion Control Blankets

Before placing the erosion control blankets, ensure the subgrade has been graded smooth; has no depressed, void areas; is free from obstructions, such as tree roots, projecting stones or other foreign matter. Verify that mesh does not include invasive species. Vehicles will not be permitted directly on the blankets.

3.2 SITE PREPARATION

3.2.1 Protecting Existing Vegetation

When there are established lawns in the work area, the turf shall be covered and/or protected or replaced after construction operations. Identify existing trees, shrubs, plant beds, and landscape features that are to be preserved on site by appropriate tags and barricade with reusable, high-visibility fencing along the dripline. Mitigate damage to existing trees at no additional cost to the Government. Damage shall be assessed by a state certified arborist or other approved professional using the National Arborist Association's tree valuation guideline.

3.3 INSTALLATION

Immediately stabilize exposed soil using fabric and mulch,. Stabilize areas for construction access immediately as specified in the paragraph Construction Entrance. Install principal sediment basins and traps before any major site grading takes place. Provide additional sediment traps and

sediment fences as grading progresses. Provide inlet and outlet protection at the ends of new drainage systems.

3.3.1 Construction Entrance

Provide as indicated on drawings, a stabilized construction access at plant entrance. At points of entrances shall be excavated a minimum of 3 inches prior to placement of the filter fabric and aggregate. The aggregate shall be placed in a manner that will prevent damage and movement of the fabric. Place fabric in one piece, where possible. Overlap fabric joints a minimum of 12 inches.

3.3.2 Erosion Control Blankets

- a. Install erosion control blankets as indicated and in accordance with manufacturer's recommendations. The extent of erosion control blankets shall be as indicated.
- b. Orient erosion control blankets in vertical strips and anchored with staples, as indicated. Abut adjacent strips to allow for installation of a common row of staples. Overlap horizontal joints between erosion control blankets sufficiently to accommodate a common row of staples with the uphill end on top.
- c. Where exposed to overland sheet flow, locate a trench at the uphill termination. Staple the erosion control blanket to the bottom of the trench. Backfill and compact the trench as required.
- d. Where terminating in a channel containing an installed blanket, the erosion control blanket shall overlap installed blanket sufficiently to accommodate a common row of staples.

3.3.3 Sediment Fencing

Install posts at the spacing indicated on drawings and at an angle between 2 degrees and 20 degrees towards the potential silt load area. Sediment fence height shall be approximately 16 inches. Do not attach filter fabric to existing trees. Secure filter fabric to the post and wire fabric using staples, tie wire, or hog rings. Imbed the filter fabric into the ground as indicated on drawings. Splice filter fabric at support pole using a 6 inches overlap and securely seal.

3.4 CLEAN-UP

Dispose of excess material, debris, and waste materials offsite at an approved landfill or recycling center. Clear adjacent paved areas. Immediately upon completion of the installation in an area, protect the area against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.5 MAINTENANCE RECORD

Furnish a record describing the maintenance work performed, record of measurements and findings for product failure, recommendations for repair, and products replaced.

3.5.1 Maintenance

Maintenance shall include eradicating weeds; protecting embankments and

ditches from surface erosion; maintaining the performance of the erosion control materials and mulch; protecting installed areas from traffic.

3.5.2 Maintenance Instructions

Furnish written instructions containing drawings and other necessary information, describing the care of the installed material; including, when and where maintenance should occur, and the procedures for material replacement. Submit instruction for year-round care of installed material. Include manufacturer supplied spare parts.

3.5.3 Patching and Replacement

Unless otherwise directed, material shall be placed, seamed or patched as recommended by the manufacturer. Remove material not meeting the required performance as a result of placement, seaming or patching from the site. Replace the unacceptable material at no additional cost to the Government.

-- End of Section --

SECTION 32 31 13.04

CHAIN LINK FENCES AND GATES

11/16

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A116	(2011) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A153/A153M	(2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A702	(2013) Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A90/A90M	(2013) Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
ASTM C94/C94M	(2017a) Standard Specification for Ready-Mixed Concrete
ASTM F1043	(2017a) Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F1083	(2016) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
ASTM F567	(2014a) Standard Practice for Installation of Chain Link Fence
ASTM F626	(2014) Standard Specification for Fence Fittings
ASTM F883	(2013) Padlocks

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191	(Rev K) Fencing, Wire and Post Metal (and Gates, Chain-Link Fence Fabric, and Accessories)
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Bunker Hill - CTP Upgrades

FS RR-F-191/1	(Rev F) Fencing, Wire and Post, Metal (Chain-Link Fence Fabric)
FS RR-F-191/2	(Rev E) Fencing, Wire and Post, Metal (Chain-Link Fence Gates)
FS RR-F-191/3	(Rev E; Am 1) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
FS RR-F-191/4	(Rev F) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fence Assembly; D
Location of Gate, Corner, End, and Pull Posts; D
Gate Assembly; D
Gate Hardware and Accessories; D
Erection/Installation Drawings; D

SD-03 Product Data

Fence Assembly; D
Gate Assembly; D
Gate Hardware and Accessories; D
Zinc Coating; D
Aluminum Alloy Coating; D
Fabric; D
Stretcher Bars; D
Concrete; D

SD-07 Certificates

Certificates of Compliance

SD-11 Closeout Submittals

Recycled Material Content

Bunker Hill - CTP Upgrades

1.3 QUALITY CONTROL

1.3.1 Certificates of Compliance

Submit [certificates of compliance](#) in accordance with the applicable reference standards and descriptions of this section for the following:

- a. Zinc coating
- b. PVC coating
- c. Aluminum alloy coating
- d. Fabric
- e. Stretcher bars
- f. Gate hardware and accessories
- g. Concrete

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide fencing materials conforming to the requirements of [ASTM A116](#), [ASTM A702](#), [ASTM F626](#).

Submit reports of listing chain-link fencing and accessories regarding weight in [ounces](#) for zinc coating, and chemical composition and thickness of [aluminum alloy coating](#).

Submit manufacturer's catalog data for complete [fence assembly](#), and [gate assembly](#).

2.2 COMPONENTS

2.2.1 [Fabric](#)

[FS RR-F-191](#) and detailed specifications as referenced and other requirements as specified.

[FS RR-F-191/1](#); Type I, zinc-coated steel, 9 gage. Mesh size, 2 inches. Provide selvage knuckled at [top selvage](#) and twisted and barbed at the [bottom](#). Height of fabric, as indicated.

Provide fabric consisting of [No. 9-gage](#) wires woven into a [2 inch](#) diamond mesh, with dimensions of fabric and wire conforming to [ASTM A116](#), with [1.20 ounces per square foot](#) zinc galvanizing.

Provide one-piece fabric widths for fence heights up to [12 feet](#).

2.2.2 Posts, Rails and Braces

FS RR-F-191/3 line posts; Class 1, steel pipe, Grade B. End, corner, and pull posts; Class 1, steel pipe, Grade B. Braces and rails; Class 1, steel pipe, Grade B, in minimum sizes listed in FS RR-F-191/3 for each class and grade.

2.2.3 Line Posts

Minimum acceptable line posts are as follows:

Up to 6 feet high:

Grade A: 1.900 inch O.D. pipe weighing 2.72 pounds per linear foot.

Over 6 feet high:

2.0 inch O.D. pipe weighing 3.65 pounds per linear foot.

2.2.4 End, Corner, and Pull Posts

Provide minimally acceptable end, corner, and pull posts as follows:

Up to 6 feet high:

Grade B: 2.375 inch O.D. pipe weighing 3.12 pounds per linear foot.

Over 6 feet high:

Grade B: 2.875 inch O.D. pipe weighing 4.64 pounds per linear foot.

2.2.5 Sleeves

Provide sleeves for setting into concrete construction of the same material as post sections, sized 1 inch greater than the diameter or dimension of the post. Weld flat plates to each sleeve base to provide anchorage and prevent intrusion of concrete.

2.2.6 Top Rail

Provide top rails, where required, with a minimum of 1.660 inches O.D. pipe rails. Grade B weighing 1.82 pounds per linear foot. Provide expansion couplings 6 inches long at each joint in top rails.

2.2.7 Center Rails Between Line Posts

For fencing over 6-feet high, provide 1.660 inches O.D. pipe center rails, Grade B weighing 1.82 pounds per linear foot.

2.2.8 Bottom Rail

Provide bottom rail, where required, conforming to minimum sizes specified in FS RR-F-191/3 for each class and grade unless members are to be oversized.

2.2.9 Post-Brace Assembly

Provide bracing consisting of 1.660 inches O.D. pipe Grade B weighing 1.82 pounds per linear foot and 3/8 inch adjustable truss rods and turnbuckles.

2.2.10 Stretcher Bars

Provide bars that have one-piece lengths equal to the full height of the fabric with a minimum cross section of 3/16 by 3/4 inch, in accordance with ASTM F626.

2.2.11 Stretcher Bar Bands

Provide bar bands for securing stretcher bars to posts that are steel, wrought iron, or malleable iron spaced not over 15 inches on center. Bands may also be used in conjunction with special fittings for securing rails to posts. Provide bands with projecting edges chamfered or eased.

2.2.12 Post Tops

Provide tops that are steel, wrought iron, or malleable iron designed as a weathertight closure cap. Provide one cap for each post, unless equal protection is provided by a combination post-cap and wire supporting arm. Provide caps with an opening to permit through passage of the top rail.

2.2.13 Gate Posts

Provide a gate post for supporting each gate leaf as follows:

Up to 6-feet wide:

2.875 inch O.D. pipe Grade A weighing 5.79 pounds per linear foot.

Over 6 feet wide and up to 13 feet wide:

2.875 inch O.D. pipe Grade A weighing 5.79 pounds per linear foot.

2.2.14 Gates

FS RR-F-191/2; Shape and size of gate frame, as indicated. Framing and bracing members, round of steel alloy. Steel member finish, zinc-coated. Provide gate frames and braces of minimum sizes listed in FS RR-F-191/3 for each Class and Grade, except that steel pipe frames are a minimum of 1.90 inches o.d., 0.120 inches minimum wall thickness. Gate fabric, is as specified for fencing fabric. Coating for steel latches, stops, hinges, keepers, and accessories, is galvanized Provide plunger bar type gate latches. Provide intermediate members as necessary for gate leaves more than 8 feet wide, to provide rigid construction, free from sag or twist. Provide truss rods or intermediate braces for gate leaves less than 8 feet wide. Attach gate fabric to gate frame in accordance with manufacturer's standards, except that welding is not permitted. Arrange padlocking latches to be accessible from both sides of gate, regardless of latching arrangement.

For gate leaves up to 6 feet high or 6 feet wide, provide perimeter gate frames of 1.66 inch O.D. pipe Grade A weighing 2.27 pounds per linear foot.

For gate leaves over 6 feet high or 6 feet wide, provide perimeter gate frames of 1.90 inch O.D. pipe Grade B weighing 2.28 pounds per linear foot.

Provide gate frame assembly that is welded or assembled with special malleable or pressed-steel fittings and rivets to provide rigid connections. Install fabric with stretcher bars at vertical edges;

stretcher bars may also be used at top and bottom edges. Attach stretcher bars and fabric to gate frames on all sides at intervals not exceeding 15 inches. Attach hardware with rivets or by other means which provides equal security against breakage or removal.

Provide diagonal cross-bracing, consisting of 3/8 inch diameter adjustable-length truss rods on welded gate frames, where necessary to obtain frame rigidity without sag or twist. Provide nonwelded gate frames with diagonal bracing.

2.2.15 Gate Hardware and Accessories

Provide gate hardware and accessories that conforms to ASTM A116 and ASTM F626, and be as specified:

Provide pressed steel hinges to suit gate size, non-lift-off type, offset to permit 180-degree opening.

Provide latch that permits operation from either side of the gate, with a padlock eye provided as an integral part of the latch.

Provide stops and holders of malleable iron for vehicular gates. Provide stops that automatically engage the gate and hold it in the open position until manually released.

Provide double gates with a drop rod and ground-set keeper, with latch or locking device and padlock eye designed as an integral part.

2.2.16 Miscellaneous Hardware

Provide miscellaneous hot-dip galvanized hardware as required.

2.2.17 Wire Ties

Provide 9-gage galvanized steel wire for tying fabric to line posts, spaced 12 inches on center. For tying fabric to rails and braces, space wire ties 24 inches on center. For tying fabric to tension wire, space 9 gage rings 24 inches on center.

Manufacturer's standard procedure will be accepted if of equal strength and durability.

FS RR-F-191/4. Provide wire ties constructed of the same material as the fencing fabric.

2.2.18 Padlocks

Provide padlocks conforming to ASTM F883, with chain.

2.3 MATERIALS

2.3.1 Zinc Coating

Provide hot-dip galvanized (after fabrication) ferrous-metal components and accessories, except as otherwise specified.

Provide zinc coating of weight not less than 1.94 ounces per square foot, as determined from the average result of two specimens, when tested in accordance with ASTM A90/A90M.

Provide zinc coating conforming to the requirements of the following:

- a. Pipe: **FS RR-F-191/3** Class 1 Grade A in accordance with **ASTM F1083**.
- b. Hardware and accessories: **ASTM A153/A153M**, Table 1
- c. Surface: **ASTM F1043**
- d. External: Type B-B surface zinc with organic coating, **0.97 ounce per square foot** minimum thickness of acrylated polymer.
- e. Internal: Surface zinc coating of **0.97 ounce per square foot** minimum.

Provide galvanizing repair material that is cold-applied zinc-rich coating conforming to **ASTM A780/A780M**.

2.3.2 Tension Wire

Provide galvanized, coiled spring wire, **No. 7-gage**. Provide zinc coating that weighs not less than **1.2 ounces per square foot**.

2.3.3 Concrete

Provide concrete conforming to **ASTM C94/C94M**, and obtaining a minimum 28-day compressive strength of **3,000 psi**.

2.3.4 Grout

Provide grout of proportions one part portland cement to three parts clean, well-graded sand and a minimum amount of water to produce a workable mix.

PART 3 EXECUTION

Submit manufacturer's **erection/installation drawings** and instructions that detail proper assembly and materials in the design for fence, gate, hardware and accessories.

Provide complete installation conforming to **ASTM F567**.

3.1 PREPARATION

Ensure final grading and established elevations are complete prior to commencing fence installation.

3.1.1 Clearing and Grading

Clear fence line of trees, brush, and other obstacles to install fencing for a distance of **5 feet** inside; and **3 feet** outside the fence. Establish a graded, compacted fence line prior to fencing installation.

3.2 INSTALLATION

3.2.1 Security

Install new chain link fencing, remove existing fencing, and perform related work to provide continuous security for facility. Schedule and fully coordinate work with **Contractor** and cognizant Security Officer.

3.2.2 Fence Installation

Install fence on prepared surfaces to line and grade indicated. Install fence in accordance with fence manufacturer's written installation instructions except as modified herein.

3.2.2.1 Post Spacing

Provide line posts spaced equidistantly apart, not exceeding 10 feet on center. Provide gate posts spaced as necessary for size of gate openings. Do not exceed 500 feet on straight runs between braced posts. Provide corner or pull posts, with bracing in both directions, for changes in direction of 15 degrees or more, or for abrupt changes in grade. Submit drawings showing location of gate, corner, end, and pull posts.

3.2.2.2 Top and Bottom Tension Wire

Install top and bottom tension wires before installing chain-link fabric, and pull wires taut. Place top and bottom tension wires within 8 inches of respective fabric line.

3.2.3 Excavation

Provide excavations for post footings which are drilled holes in virgin or compacted soil, of minimum sizes as indicated.

Space footings for line posts 10 feet on center maximum and at closer intervals when indicated, with bottoms of the holes approximately 3 inches below the bottoms of the posts. Set bottom of each post not less than 36 inches below finished grade when in firm, undisturbed soil. Set posts deeper, as required, in soft and problem soils and for heavy, lateral loads.

Uniformly spread soil from excavations adjacent to the fence line or on areas of Government property, as directed. When solid rock is encountered near the surface, drill into the rock at least 12 inches for line posts and at least 18 inches for end, pull, corner, and gate posts. Drill holes at least 1 inch greater in diameter than the largest dimension of the placed post.

If solid rock is below the soil overburden, drill to the full depth required except that penetration into rock need not exceed the minimum depths specified above.

3.2.4 Setting Posts

Remove loose and foreign materials from holes and moisten the soil prior to placing concrete.

Provide tops of footings that are trowel finished and sloped or domed to shed water away from posts. Set hold-open devices, sleeves, and other accessories in concrete.

Keep exposed concrete moist for at least 7 calendar days after placement or cured with a membrane curing material, as approved.

Grout all posts set into sleeved holes in concrete with an approved grouting material.

Maintain vertical alignment of posts in concrete construction until

concrete has set.

3.2.4.1 Earth and Bedrock

Provide concrete bases of dimensions indicated on the manufactures installation drawings, except in bedrock. Compact concrete to eliminate voids, and finish to a dome shape. In bedrock, set posts with a minimum of 1 inch of grout around each post. Work grout into hole to eliminate voids, and finish to a dome shape.

3.2.4.2 Bracing

Brace gate, corner, end, and pull posts to nearest post with a horizontal brace used as a compression member, placed at least 12 inches below top of fence, and a diagonal tension rod.

a. Tolerances

Provide posts that are straight and plumb within a vertical tolerance of 1/4 inch after the fabric has been stretched. Provide fencing and gates that are true to line with no more than 1/2 inch deviation from the established centerline between line posts. Repair defects as directed.

3.2.5 Concrete Strength

Provide concrete that has attained at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than 7 calendar days after placement, before rails, tension wire, or fabric are installed. Do not stretch fabric and wires or hang gates until the concrete has attained its full design strength.

Take samples and test concrete to determine strength as specified.

3.2.6 Top Rails

Provide top rails that run continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by the fencing manufacturer.

3.2.7 Center Rails

Provide single piece center rails between posts set flush with posts on the fabric side, using special offset fittings where necessary.

3.2.8 Brace Assembly

Provide bracing assemblies at end and gate posts and at both sides of corner and pull posts, with the horizontal brace located at midheight of the fabric.

Install brace assemblies so posts are plumb when the diagonal rod is under proper tension.

Provide two complete brace assemblies at corner and pull posts where required for stiffness and as indicated.

3.2.9 Tension Wire Installation

Install tension wire by weaving them through the fabric and tying them to

each post with not less than 7-gage galvanized wire or by securing the wire to the fabric with 10-gage ties or clips spaced 24 inches on center.

3.2.10 Fabric Installation

Provide fabric in single lengths between stretch bars with bottom barbs placed approximately 1-1/2 inches above the ground line. Pull fabric taut and tied to posts, rails, and tension wire with wire ties and bands.

Install fabric on the security side of fence, unless otherwise directed.

Ensure fabric remains under tension after the pulling force is released.

3.2.11 Stretcher Bar Installation

Thread stretcher bars through or clamped to fabric 4 inches on center and secured to posts with metal bands spaced 15 inches on center.

3.2.12 Gate Installation

Install gates plumb, level, and secure, with full opening without interference. Install ground set items in concrete for anchorage as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricated where necessary.

3.2.13 Tie Wires

Provide tie wires that are U-shaped to the pipe diameters to which attached. Twist ends of tie wires not less than two full turns and bent so as not to present a hazard.

3.2.14 Fasteners

Install nuts for tension bands and hardware on the side of the fence opposite the fabric side. Peen ends of bolts to prevent removal of nuts.

3.2.15 Zinc-Coating Repair

Clean and repair galvanized surfaces damaged by welding or abrasion, and cut ends of fabric, or other cut sections with specified galvanizing repair material applied in strict conformance with the manufacturer's printed instructions.

3.2.16 Accessories Installation

3.2.16.1 Post Caps

Design post caps to accommodate top rail. Install post caps as recommended by the manufacturer.

3.2.16.2 Padlocks

Provide padlocks for gate openings and provide chains that are securely attached to gate or gate posts. Provide padlocks keyed alike, and provide two keys for each padlock.

3.2.17 Grounding

Ground fencing as indicated on drawings and specified.

Ground fences on each side of all gates, at each corner, at the closest approach to each building located within 50 feet of the fence, and where the fence alignment changes more than 15 degrees. Grounding locations can not exceed 650 feet. Bond each gate panel with a flexible bond strap to its gate post. Ground fences crossed by power lines of 600 volts or more at or near the point of crossing and at distances not exceeding 150 feet on each side of crossing. Provide ground conductor consisting of No. 6 AWG solid copper wire. Provide copper-clad steel rod grounding electrodes 3/4 inch by 10 foot long. Drive electrodes into the earth so that the top of the electrode is at least 6 inches below the grade. Where driving is impracticable, bury electrodes a minimum of 12 inches deep and radially from the fence, with top of the electrode not less than 2 feet or more than 8 feet from the fence. Clamp ground conductor to the fence and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods. Total resistance of the fence to ground cannot exceed 25 ohms.

3.3 CLOSEOUT ACTIVITIES

Remove waste fencing materials and other debris from the work site.

Submit manufacturer's data indicating percentage of recycled material content in protective fence materials, including chain link fence, fabric, and gates to verify affirmative procurement compliance.

-- End of Section --

SECTION 32 32 23.04

SEGMENTAL CONCRETE BLOCK RETAINING WALL
04/08

PART 1 GENERAL

Retaining walls are required to construct to the dimensions and heights as shown on the Drawings. The wall system shall be a Contractor design, consisting of a segmental concrete block retaining wall.

As described herein, the wall shall either be comprised of a reinforced fill with segmental block facing as depicted on the Drawings or a gravity-type wall comprised of larger precast concrete blocks without reinforcement.

1.1 MEASUREMENT AND PAYMENT

Payment will be full compensation for engineering services, excavation and preparatory work, and furnishing all material, labor and equipment to complete all retaining walls.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 288 (2015) Standard Specification for
Geotextile Specification for Highway
Applications

ASTM INTERNATIONAL (ASTM)

ASTM C1372 (2016) Standard Specification for Dry-Cast
Segmental Retaining Wall Units

ASTM D1241 (2015) Materials for Soil-Aggregate
Subbase, Base, and Surface Courses

ASTM D2487 (2011) Soils for Engineering Purposes
(Unified Soil Classification System)

ASTM D2488 (2009a) Description and Identification of
Soils (Visual-Manual Procedure)

ASTM D448 (2012) Sizes of Aggregate for Road and
Bridge Construction

ASTM D4595 (2017) Standard Test Method for Tensile
Properties of Geotextiles by the
Wide-Width Strip Method

ASTM D698 (2012; E 2014; E 2015) Laboratory

Compaction Characteristics of Soil Using
Standard Effort (12,400 ft-lbf/cu. ft.
(600 kN-m/cu. m.))

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)

NCMA TR127B

(2010) Design Manual for Segmental
Retaining Walls

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

FHWA NHI-00-043

(2000) Mechanically Stabilized Earth Walls
and Reinforced Soil Slopes Design and
Construction Guidelines (ISDDC)

1.3 DEFINITIONS

1.3.1 Blocks

Segmental concrete retaining wall units will be referred to as blocks.

1.3.2 Drainage Aggregate

Granular soil or aggregate which is placed within, between, and/or
immediately behind segmental concrete units.

1.3.3 Fill

Soil or aggregate placed in, behind, or below the wall will be referred to
as fill.

1.3.4 Reinforced Fill

Soil which is placed and compacted within the neat line volume of
reinforcement as outlined on the plans.

1.3.5 Retained Fill

Soil which is placed and compacted behind the reinforced fill.

1.3.6 Reinforcement

Reinforcement shall consist of a geogrid or a geotextile product
manufactured for use as reinforcing. Reinforcement shall not include steel
products.

1.3.7 Long Term Design Strength

The long term design strength (LTDS) is:

$$LTDS = T_{ult} / (RF_D * RF_{ID} * RF_{CR})$$

where:

T_{ult} is the ultimate strength
 RF_D is the reduction factor for chemical and biological durability
 RF_{ID} is the reduction factor for installation damage
 RF_{CR} is the reduction factor for creep

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; describing the wall dimensions, layout, indication of wall face, and reinforcement dimensions (if required)

SD-03 Product Data

Components and Equipment
Supplier Qualifications
Manufacturer's Representative
Soil Testing
Calculations
Reinforcement

1.5 QUALITY ASSURANCE

1.5.1 Contractor Qualifications

Furnish **Components and equipment** that are standard products of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. Submit descriptive technical data on the blocks, wall caps, masonry adhesive, reinforcement, geotextile filter materials and equipment to be used. The submittal shall include all material properties specified under PART 2 PRODUCTS. The submittal shall also include a copy of any standard manufacturer's warranties for the products. The standard products shall have been in satisfactory commercial or industrial use for 2 years before award of this contract.

1.5.2 Supplier Qualifications

Submit documentation showing that the installer and supplier meet the qualifications listed. Suppliers of segmental retaining wall system components shall have demonstrated experience of at least 2 years in the supply of similar size and types of segmental retaining walls on previous projects.

1.5.3 Manufacturer's Representative

Provide a qualified and experienced representative from the block or reinforcement manufacturer available on an as-needed basis during the wall construction.

1.6 DELIVERY, STORAGE, AND HANDLING

Check products upon delivery to assure that the proper material has been received and is undamaged.

1.6.1 Segmental Concrete Units

Protect blocks from damage and exposure to cement, paint, excessive mud, and like materials. Check materials upon delivery to assure that the block dimensions are within the tolerances specified.

1.6.2 Geosynthetic Handling

Geosynthetic rolls shall be handled and unloaded by hand, or with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Geosynthetic rolls shall not be dragged, lifted by one end, lifted by cables or chains, or dropped to the ground.

1.6.3 Geosynthetic Storage

Protect geosynthetics from cement, paint, excessive mud, chemicals, sparks and flames, temperatures in excess of 160 degrees F, and any other environmental condition that may degrade the physical properties. If stored outdoors, the rolls shall be elevated from the ground surface. Geosynthetics, except for extruded grids, shall be protected with an opaque waterproof cover. Geosynthetics shall be delivered to the site in a dry and undamaged condition. Geotextiles shall not be exposed to direct sunlight for more than 7 days.

PART 2 PRODUCTS

2.1 SYSTEM REQUIREMENTS

This work element includes engineering services in addition to the construction requirements. The Contractor is responsible for engineering services that include design of the wall in accordance with the National Concrete Masonry Association design method, and providing shop drawings indicating all features of the complete design. This work element includes engineering in addition to the construction requirements. The NCMA design method for segmental retaining walls considers potential failure modes categorized by external, internal, local, compound, and global stability. The Contractor is responsible for engineering services that include analysis of the wall for all modes of stability, and providing shop drawings indicating all features of the complete design.

2.1.1 Design Requirements

Complete all stability analyses in accordance with either the NCMA TR127B, or the Federal Highway Administration/AASHTO method detailed in FHWA NHI-00-043. Only one method shall be followed for the complete design, including reinforcement design strength, layout, stability calculations, and seismic effects. The segmental retaining wall system shall be designed under the direction of, and be signed by, a professional engineer.

2.1.2 Design Parameters

Calculations shall include determination of long term design strength of reinforcement specific to this project in accordance with the NCMA TR127B or FHWA NHI-00-043. The ultimate strength or index strength shall be based on the minimum average roll value tensile strength of the product using the wide width strength test in ASTM D4595. Submit Design calculations, including computer output data and program documentation. Design calculations shall include a clear outline of material properties and assumptions. Use the following soil parameters and water elevation for stability analysis, and select additional soil parameters as required to complete the analysis.

Moist Unit Weight of reinforced fill	125 pcf
Saturated Unit Weight of reinforced fill	130 pcf
Internal Friction Angle of reinforced fill	35 degrees
Cohesion of reinforced fill	0 psf
Water Elevation in reinforced fill	2,271 feet

2.1.2.1 External Stability Design Requirements

As a minimum requirement, the length of the reinforcing at the base of the wall shall not be less than 0.7 times the total height of the blocks, if reinforcing is required.

2.1.2.2 Seismic Design Requirements

A seismic stability analysis is not required for these temporary walls.

2.1.3 Layout

Shop drawings shall reflect all information needed to fabricate and erect the walls including the leveling pad elevations; the shape and dimensions of wall elements; the number, size, type, and details of the soil reinforcing system and anchorage; and identification of areas requiring coping. Submit Fabrication and installation drawings. Include with the shop drawings all items described under paragraph SEGMENTAL RETAINING WALL DESIGN. If approved by the Contracting Officer, shop drawings may consist of marked up contract drawings showing exact dimensions for the blocks supplied, required coping, and other minor revisions. The design and layout of the internal reinforcement shall be subject to the following:

- a. All features indicated in the contract documents shall be incorporated in the final design and construction.
- b. The leveling pad elevations may vary, but shall be no higher than the embedment depth profile shown.
- c. Each reinforcement level shall run as continuous as practical throughout the profile. If a geotextile filter is present, the reinforcement shall be laid out so that interference with the geotextile is minimized.
- d. Any reinforcement not placed as the design reinforcement direction shall be identified on the shop drawings.
- e. Reinforcement attached to the wall facing shall not combine geogrid and geotextile, nor products from different manufacturers, within one wall. The number of reinforcement products shall be limited to avoid confusion in placement. For walls under 12 feet high, all reinforcement shall be the same grade and strength (i.e. design with one reinforcement strength).

2.2 SEGMENTAL CONCRETE UNITS

2.2.1 Architectural requirements

2.2.1.1 Batter

Engage blocks to the block below by use of keys, lips, pins, clips, or other reliable mechanism to provide a consistent wall batter between 1H:6V and 1H:4V.

2.2.1.2 Block Size

A minimum of $\frac{2}{3}$ square feet of face area, and minimum 6 inch height.

2.2.1.3 Bond Configuration

No bond configuration is required for straight face blocks. Design beveled or sculptured face blocks to stack with a half-bond (joints located at midpoint of vertically adjacent blocks). Finish the block edges so that vertical joints are flush.

2.3 REINFORCEMENT

2.3.1 Geogrid Reinforcement

Geogrid shall be a geosynthetic manufactured for reinforcement applications. The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil, aggregate, or other fill materials. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. The geogrid shall be manufactured with 100 percent virgin resin consisting of polyethylene, polypropylene, or polyester, and with a maximum of 5 percent in-plant regrind material. Polyester resin shall have a minimum molecular weight of 25,000 and a carboxyl end group number less than 30. Polyethylene and polypropylene shall be stabilized with long term antioxidants.

2.3.2 Geotextile Reinforcement

Geotextile shall be a pervious sheet of polymeric material and shall consist of long-chain synthetic polymers composed of at least 95 percent by weight polyethylene, polypropylene, or polyesters. The geotextile shall be manufactured with 100 percent virgin resin, and with a maximum of 5 percent in-plant regrind material. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the selvages. Polyester resin shall have a minimum molecular weight of 20,000 and a carboxyl end group number less than 50. Polyethylene and polypropylene shall be stabilized with long term antioxidants. For survivability during installation, and in addition to installation damage used in calculating the long term design strength, the geotextile shall meet the minimum requirements in AASHTO M 288 Class 1, and shall have a minimum mass per unit area of 8 oz/sy.

2.3.3 Reinforcement Properties

The reinforcement shown in the approved shop drawing submittal shall meet the design strength requirements used in the design.

Submit affidavit certifying that the reinforcement meets the project specifications. The affidavit must be signed by an official authorized to certify on behalf of the manufacturer and shall be accompanied by a mill certificate that verifies physical properties were tested during manufacturing and lists the manufacturer's quality control testing. Include in the documents a statement confirming that all purchased resin used to produce reinforcement is virgin resin. Include in the mill certificate the tensile strength tested in accordance with ASTM D4595. Reinforcement strength requirements represent minimum average roll values in the machine direction.

2.4 SOILS AND AGGREGATES

All material placed as fill shall consist of material classified by ASTM D2487 as GW, GP, GC, GM, SP, SM, SC, CL, ML, or SW. The material shall be free of ice; snow; frozen earth; trash; debris; sod; roots; organic matter; contamination from hazardous, toxic or radiological substances; or stones larger than 3 inches in any dimension. Each material shall be obtained entirely from one borrow source, unless the Contracting Officer determines that quality control is adequate and the alternate source produces material that is similar in gradation, texture, and interaction with the reinforcement. Supply any testing required by the Contracting Officer to evaluate alternate sources. All materials shall be of a character and quality satisfactory for the purpose intended.

2.4.1 Drainage Aggregate

Meet the requirements of ASTM D448, size No. 4, nominal size 1.5 to 0.75 inch.

2.4.2 Aggregate Base Material

For the wall leveling pads meet the requirements of ASTM D1241, gradation C.

2.4.3 Reinforced Fill

Soil placed in the reinforced fill zone must consist of granular material with less than 5 percent passing the No. 200 sieve.

2.4.4 Retained Fill

Soil placed in the retained fill zone must meet the minimum requirements above.

PART 3 EXECUTION

3.1 CLASSIFICATION OF SOIL MATERIALS

Perform classification of soil materials in accordance with ASTM D2488. The Contracting Officer reserves the right to revise the Contractor classifications. In the case of disagreement, the Contracting Officer's classification will govern unless the soils are classified in accordance with ASTM D2487. All testing completed by the Contractor in conjunction with soil material classification will be considered incidental to the contract work.

3.2 EARTHWORK

The leveling pad and reinforced fill zone shall bear on undisturbed native

soils, or acceptably placed and compacted fill. In the event that it is necessary to remove material to a depth greater than specified or to place fill below the leveling pad not otherwise provided for in the contract, the Contracting Officer shall be notified prior to work and an adjustment in the contract price will be considered in accordance with the contract. Additional work not authorized by the Contracting Officer shall be at the Contractor's expense.

3.2.1 Excavation

Foundation soil shall be excavated as required for leveling pad dimensions and reinforcement placement shown on the construction drawings. Material for backfilling shall be stockpiled in a neat and orderly manner at a sufficient distance from the banks of the excavation to avoid overloading and to prevent slides or caving. Excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. The Contractor is responsible for disposal of surplus material, waste material, and material that does not meet specifications, including any soil which is disturbed by the Contractor's operations or softened due to exposure to the elements and water.

3.2.2 Stockpiles

Stockpiles of all material to be incorporated into the work shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed. Topsoil shall be stockpiled separately from suitable backfill material. Stockpiles of aggregates and granular soils shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes frozen, saturated, intermixed with other materials, or otherwise out of specification or unsatisfactory for the use intended, such material shall be removed and replaced with new material from approved sources at no additional cost to the Prime Contractor.

3.3 LEVELING PAD

3.3.1 Aggregate Base Leveling Pad

The subgrade below the leveling pad shall be compacted with at least 3 passes with a vibratory plate compactor with an operating weight not less than 450 pounds. The aggregate base material shall be placed in lifts not exceeding 6 inches and compacted with at least 3 passes with a vibratory plate compactor. If the subgrade or aggregate base pumps, bleeds water, or cracks during compaction, the Contracting Officer shall be notified and, if no other changes are directed, the aggregate shall be replaced with a concrete leveling pad.

3.3.2 Concrete Leveling Pad

Tolerances in screeding shall be sufficient to place the blocks directly on the leveling pad without mortar, pointing, or leveling course between the blocks and leveling pad.

3.4 BLOCK INSTALLATION

The wall system components shall be constructed in accordance with the wall supplier's recommendations and construction manual. Damaged blocks shall not be incorporated in the retaining wall.

- a. Block placement shall begin at the lowest leveling pad elevation. The blocks shall be in full contact with the leveling pad. Each course of block shall be placed sequentially for the entire wall alignment to maintain a level working platform for layout of reinforcement and placement of fill.
- b. The grade and alignment of the first course shall be surveyed and the results furnished to the Contracting Officer prior to placing the second course. Survey control for alignment shall include a string line, offset from a base line, or suitable provisions that can be reproduced for quality assurance.
- c. Place the blocks with the edges in tight contact. Maintain the vertical joints with a minimum 4 inch overlap on the underlying block. Do coping required to keep block alignment with a full depth saw cut. No splitting is allowed.
- d. Stacking of blocks prior to filling any lower course of block with drainage aggregate will not be allowed.

3.5 REINFORCEMENT INSTALLATION

- a. Before placing reinforcement, compact the subgrade or subsequent lift of fill and grade level with the top of the blocks. The surface must be smooth and free of windrows, sheepsfoot impressions, and rocks.
- b. Place reinforcement at the elevations and to the extent shown on the construction drawings and the approved shop drawing submittal. Reinforcement shall be oriented with the design strength axis perpendicular to the wall face. Each segment of reinforcement shall be continuous. Spliced connections between shorter pieces of reinforcement will not be allowed. Place reinforcement strips immediately next to adjacent strips to provide 100 percent coverage.
- c. Install the reinforcement in tension. Pull the reinforcement taut and anchor with staples or stakes prior to placing the overlying lift of fill. The tension must be uniform along the length of the wall and consistent between layers.
- d. All reinforcement must be 100 percent covered by soil so that reinforcement panels do not contact in overlaps. Where the wall bends, place a veneer of fill to a nominal thickness of 3 inches to separate overlapping reinforcement.

3.6 FILL PLACEMENT

- a. Fill placement, including drainage aggregate, shall be completed to the top of each course of facing blocks prior to stacking the subsequent course of blocks.
- b. Reinforced fill shall be placed from the wall back toward the fill area to ensure that the reinforcement remains taut. Fill shall be placed, spread, and compacted in such manner that minimizes the development of wrinkles in or movement of the reinforcement.
- c. A minimum fill thickness of 6 inches is required prior to operation of vehicles over the reinforcement. Sudden braking and sharp turning shall be avoided. Tracked equipment shall not turn within the

reinforced fill zone to prevent tracks from displacing the fill and damaging the reinforcement. Construction equipment shall not be operated directly upon the reinforcement as part of the planned construction sequence. Rubber tired equipment may operate directly on the reinforcement if: the Contractor submits information documenting testing of equipment operating on a similar geogrid product on similar soils, the travel is infrequent, equipment travels slow, turning is minimized, and no damage or displacement to the reinforcement is observed.

- d. Drainage aggregate shall be placed and tamped directly behind, between, and within the cells of the facing units. Compaction of the drainage aggregate shall be achieved by at least two passes on each lift with a vibratory plate compactor. Care shall be taken not to contact or chip the blocks with the compactor. Aggregate placed within the block cores and recesses shall be compacted by hand tamping and rodding.
- e. At the end of each day, slope the last lift of fill away from the wall in a manner that will allow drainage and direct runoff away from the wall face.

3.7 COMPACTION

Fill shall not be placed on surfaces that contain mud, frost, organic soils, fill soils that have not met compaction requirements, or where the Contracting Officer determines that unsatisfactory material remains in or under the fill. Fill shall be spread and compacted in lifts not exceeding the height of one course of blocks.

3.7.1 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in [ASTM D698](#). The maximum density is hereafter abbreviated as the "Standard Proctor" value.

3.7.2 Moisture Control

Control of moisture in the fill shall be maintained to provide acceptable compaction. Disking and plowing will not be allowed in the reinforced fill zone. Moisture content of cohesive soils shall be adjusted at the borrow source before placement. Adding water directly to the reinforced fill zone shall only be conducted under conditions where the soil has sufficient porosity and capillarity to provide uniform moisture throughout the fill during compaction.

3.7.3 Compaction

Reinforced and retained fill shall be compacted to 95 percent of the Standard Proctor Density. Care shall be exercised in the compaction process to avoid misalignment of the facing blocks. Heavy compaction equipment (including vibratory drum rollers) shall not be used within [3 feet](#) from the wall face.

3.8 [SOIL TESTING](#)

3.8.1 Testing Schedule

All testing for soil compaction shall be in accordance with the requirements for Paragraph 3.11 Testing in Section [31 00 00.04](#) EARTHWORK.

3.9 DRAINAGE PIPE

Drain pipe shall be placed as indicated on the drawings. Drain lines shall be laid to true grades and alignment with a continuous fall in the direction of flow. The interior of the pipe shall be kept clean from soil and debris; and open ends shall be temporarily capped as necessary.

3.10 CONSTRUCTION TOLERANCES

3.10.1 Horizontal

The top of wall must be within 3 inches of the plan location.

3.10.2 Vertical

The top of wall elevations must be within 0.1 feet above to 0.1 feet below the prescribed top of wall elevations indicated.

3.10.3 Plumbness and Alignment

The wall batter and alignment offset measured as deviation from a straight edge must be within plus or minus 1.25 inches per 10 feet section. The batter measured from vertical must be within 2 degrees of the plan dimension.

3.10.4 Block Defects

The blocks will be accepted on the basis of tolerances specified in ASTM C1372.

3.10.5 Block Gaps

Gaps between adjacent blocks must not exceed 1/8 inch.

3.11 PROTECTION OF WORK

Protect work against damage from subsequent operations. Remove disturbed or displaced blocks and replace to conform to all requirements of this section. Do not incorporate damaged material into the wall. Upon completion of wall erection, clean the wall face to remove any loose soil deposits or stains.

-- End of Section --

SECTION 33 11 00.04

WATER UTILITY DISTRIBUTION PIPING
05/16

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(2010; Addenda 2011) Hypochlorites
AWWA B301	(2010) Liquid Chlorine
AWWA C104/A21.4	(2016) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105/A21.5	(2010) Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110/A21.10	(2012) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2017) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115/A21.15	(2011) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C153/A21.53	(2011) Ductile-Iron Compact Fittings for Water Service
AWWA C500	(2009) Metal-Seated Gate Valves for Water Supply Service
AWWA C502	(2014) Dry-Barrel Fire Hydrants
AWWA C509	(2015) Resilient-Seated Gate Valves for Water Supply Service
AWWA C512	(2007) Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service
AWWA C515	(2015) Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
AWWA C600	(2017) Installation of Ductile-Iron Mains and Their Appurtenances
AWWA C604	(2011) Installation of Buried Steel Water Pipe—4 In. (100 mm) and Larger

AWWA C605	(2013) Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
AWWA C651	(2014) Standard for Disinfecting Water Mains
AWWA C900	(2016) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
AWWA C906	(2015) Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) through 65 In., (1,575 mm) for Water Distribution and Transmission
AWWA M23	(2002; 2nd Ed) Manual: PVC Pipe - Design and Installation
AWWA M55	(2006) PE Pipe - Design and Installation
AWWA M9	(2008; Errata 2013) Manual: Concrete Pressure Pipe

ASME INTERNATIONAL (ASME)

ASME B16.1	(2015) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.5	(2013) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard

ASTM INTERNATIONAL (ASTM)

ASTM A536	(1984; R 2014) Standard Specification for Ductile Iron Castings
ASTM C94/C94M	(2017a) Standard Specification for Ready-Mixed Concrete
ASTM D2657	(2007; R 2015) Heat Fusion Joining Polyolefin Pipe and Fittings
ASTM D3035	(2015) Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D3139	(1998; R 2011) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3261	(2016) Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM F1055	(2016) Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled

Polyethylene and Crosslinked Polyethylene
(PEX) Pipe and Tubing

ASTM F1674	(2011) Standard Test Method for Joint Restraint Products for Use with PVC Pipe
ASTM F2164	(2013) Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure
ASTM F477	(2014) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F714	(2013) Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)

FCCCHR List	(continuously updated) List of Approved Backflow Prevention Assemblies
FCCCHR Manual	(10th Edition) Manual of Cross-Connection Control

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 24	(2013) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
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NSF INTERNATIONAL (NSF)

NSF 372	(2011) Drinking Water System Components - Lead Content
NSF/ANSI 14	(2017b) Plastics Piping System Components and Related Materials
NSF/ANSI 61	(2016) Drinking Water System Components - Health Effects

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2016; with Change 1) Fire Protection Engineering for Facilities
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UNDERWRITERS LABORATORIES (UL)

UL 246	(2011; Reprint Feb 2013) Hydrants for Fire-Protection Service
UL 262	(2004; Reprint Oct 2011) Gate Valves for Fire-Protection Service

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipe, Fittings, Joints and Couplings

Valves

Hydrants

Pipe Anchorage

Tapping Sleeves

Backflow Preventers

SD-06 Test Reports

Backflow Preventer Tests

Bacteriological Samples

SD-07 Certificates

Pipe, Fittings, Joints and Couplings

Lining

Valves

Hydrants

Backflow Prevention Training Certificate

Backflow Tester Certification

Disinfection Procedures

SD-08 Manufacturer's Instructions

Manufacturer's Instructions

1.3 QUALITY CONTROL

1.3.1 Regulatory Requirements

Comply with NSF/ANSI 61 and NSF 372 for materials for potable water piping, components and specialties for domestic water; comply with lead content requirements for "lead-free" plumbing as defined by the U.S. Safe Drinking Water Act effective January 2014.

Comply with NSF/ANSI 14 for plastic potable water piping and components. Provide plastic pipe and fittings, bearing the seal of the National Sanitation Foundation (NSF) for potable water service from the same manufacturer.

Comply with **NFPA 24** for materials, installation, and testing of fire main piping and components.

1.3.2 Backflow Preventers

1.3.2.1 Backflow Preventers Certificate

Certificate of Full Approval from **FCCCHR List**, University of Southern California, attesting that the design, size and make of each backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. Certificate of Provisional Approval will not be acceptable.

1.3.2.1.1 Backflow Tester Certificate

Prior to testing, submit to the **Prime Contractor** certification issued by the State or local regulatory agency attesting that the **backflow tester** has successfully completed a certification course sponsored by the regulatory agency. Tester must not be affiliated with any company participating in any other phase of this Contract.

1.3.2.1.2 Backflow Prevention Training Certificate

Submit a certificate recognized by the State or local authority that states the Contractor has completed at least 10 hours of training in backflow preventer installations. The certificate must be current.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling and in accordance with manufacturer's instructions. Store materials on site in enclosures or under protective covering. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, valves, **hydrants**, and other accessories free of dirt and debris.

1.4.2 Handling

Handle pipe, fittings, valves, **hydrants**, and other accessories in accordance with manufacturer's instructions and in a manner to ensure delivery to the trench in sound undamaged condition. Avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged. Do not place other material, hooks, or pipe inside a pipe or fitting after the coating has been applied. Inspect the pipe for defects before installation. Carry, do not drag pipe to the trench. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. Clean the interior of pipe and accessories of foreign matter before being lowered into the trench and keep them clean during laying operations by plugging. Replace material found to be defective before or after laying with sound material without additional expense to the Government. Store rubber gaskets that are not to be installed immediately, under cover out of direct sunlight.

Handle ductile iron pipe, fittings, and accessories in accordance with **AWWA C600**. Handle PVC pipe, fittings, and accessories in accordance with

AWWA C605. Handle PE pipe, fittings, and accessories in accordance with
AWWA M55. Handle steel pipe, fittings and accessories in accordance with
AWWA C604.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Fire Protection Water Piping

DR25 PVC service connection to the water main of Central Shoshone Water District, a backflow prevention assembly, DR11 HDPE pipes, valves and hydrants in CTP yard.

2.1.2 Potable Water Piping

Replace existing 4-inch city water (potable water) to suit lowered ground elevation as shown on Drawing C-424, and adjust existing potable water pipe elevations if it conflicts with new large pipes.

2.1.3 Buried and Overland Process Piping

One 20-inch DR21 HDPE direct feed water pipe (DP) from the tie-in point on the existing mine water pipe to the pipe rack near Reactors.

One 24-inch DR21 HDPE lined pond water pipe (LP) from the pre-installed tee near temporary treatment plant to the pipe rack near Reactors.

Two 14-inch DR21 HDPE groundwater collection pipes (GWCP) from the north perimeter fence (come from groundwater wells)

One 14-inch DR21 HDPE GWCP from CTP northeast corner to southwest corner (continued to the Lined Pond).

One 4-inch DR17 HDPE sludge filtrate (from sludge impoundment area) between CTP north perimeter fence and the pipe rack near reactors.

Two 24-inch DR21 influent and effluent water pipes between the existing/new thicker and filter building.

One 20-inch DR21 HDPE filter effluent water pipe from the pipe rack near reactors to the north perimeter fence (continued to outlet).

Two 3-inch DR9 HDPE sludge pipes to the north perimeter fence (continued to existing sludge pond and sludge impoundment area).

2.1.4 Storm Drainage Utilities

See Section 33 40 00.04 STORM DRAINAGE UTILITIES. Provide buried roof drain discharge piping for filter building. Provide drain, oil water separator, oil stop valve and manual shut-off valve for the Petroleum, Oil and Lubricant (POL) containment pad. Provide culvert for road crossing ditch

2.1.5 Foundation Drain

Provide foundation drain for the existing maintenance building. See Section 33 46 13.04.14 FOUNDATION DRAINAGE.

2.2 PIPE, FITTINGS, JOINTS AND COUPLINGS

Submit manufacturer's standard drawings or catalog cuts, except submit both drawings and cuts for push-on and rubber-gasketed bell-and-spigot joints. Include information concerning gaskets with submittal for joints and couplings.

2.2.1 Ductile-Iron Piping

Ductile iron pipes and fittings are used only for the fire water backflow prevention assembly.

2.2.1.1 Pipe and Fittings

- a. Pressure Class 350 standard thickness. Flanged pipe, AWWA C115/A21.15. Fittings, AWWA C110/A21.10 or AWWA C153/A21.53. Provide fittings with pressure ratings equivalent to that of the pipe. Pipe ends and fittings are to be compatible for the specified joints. Provide cement-mortar lining, AWWA C104/A21.4, standard thickness on pipe and fittings.

2.2.1.2 Joints and Jointing Material

Provide mechanical joints for pipe and fittings unless otherwise indicated. Provide flanged joints where indicated. Provide mechanically coupled type joints using a sleeve-type mechanical coupling where indicated. Sleeve-type mechanical couplings in lieu of push-on joints are acceptable, subject to the limitations specified in the paragraph SLEEVE-TYPE MECHANICAL COUPLINGS.

- a. Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets as recommended in AWWA C111/A21.11.
- b. Flanged Joints: Bolts, nuts, and gaskets for flanged connections as recommended in the Appendix to AWWA C115/A21.15. Provide ductile iron setscrewed flanges, ASTM A536, Grade 70-50-05 or 60-42-10, and conform to ASME B16.1, Class 125. Provide setscrews for setscrewed flanges with a tensile strength of 190,000 psi, heat treated and zinc-coated steel. Gasket and lubricants for setscrewed flanges, in accordance with mechanical-joint gaskets specified in AWWA C111/A21.11. During the design of setscrewed gasket provide for confinement and compression of gasket when joint to adjoining flange is made.

2.2.2 Plastic Piping

2.2.2.1 Pressured PVC Piping

Pressured PVC pipes are used only for the fire water service connection to the water main of Central Shoshone Water District, and replacement of existing potable water pipe in CTP yard.

- a. Plain end or gasket bell end, with a minimum Pressure Class 165 (DR25), AWWA C900 with ductile iron outside diameter (DIOD).

2.2.2.1.1 Fittings for PVC Pipe

Fittings and specials of the same material as the pipe with elastomeric gaskets, in conformance with AWWA C605 and AWWA C900.

2.2.2.1.2 Joints and Jointing Material

Provide push-on joints ASTM D3139 between pipes, pipes and metal fittings, valves, and other accessories or compression-type joints/mechanical joints, ASTM D3139 and AWWA C111/A21.11. Provide each joint connection with an elastomeric gasket compatible for the bell or coupling with which it is to be used. Gaskets for push-on joints for pipe, ASTM F477. Gaskets for push-on joints and compression-type joints/mechanical joints for joint connections between pipe and metal fittings, valves, and other accessories, AWWA C111/A21.11, respectively, for push-on joints and mechanical joints. Utilize mechanically coupled joints using a sleeve-type mechanical coupling, as specified in the paragraph SLEEVE-TYPE MECHANICAL COUPLINGS, as an optional jointing method in lieu of push-on joints on plain-end PVC plastic pipe, subject to the limitations specified for mechanically coupled joints using a sleeve-type mechanical coupling and to the use of internal stiffeners as specified for compression-type joints in ASTM D3139.

2.2.2.2 HDPE Fire Protection Piping

AWWA C906, ASTM D3035, PE4710, with a minimum Pressure Class 200 (DR11) with ductile iron outside diameter (DIOD).

2.2.2.2.1 Fittings For PE Pipe

AWWA C906, AWWA M55, ASTM D3035, molded and manufactured to comply with ASTM F714. AWWA C906, AWWA M55, ASTM D3261 for butt fusion fittings ANSI Class 150 or as necessary to provide minimum pressure rating.

2.2.2.2.1.1 Joints and Jointing Materials

- a. Mechanical Joint: DIOD Mechanical joint adapter and gaskets for mechanical joints for joint connections between pipe and metal fittings, valves, and other accessories, AWWA C111/A21.11.
- b. Butt Fusion: Jointing is to comply with ASTM D2657, Butt Fusion. No offset in alignment between adjacent pipe joints or fittings is permitted.
- c. Electrofusion: Jointing to comply with ASTM F1055.
- d. Flanged joint: flange joint adaptor, back rings and gaskets, comply to ASME B16.5.

2.2.3 HDPE Process Piping

See Appendix A, Piping Design Standard, PPE2BW.

2.2.4 Pipe Anchorage

Provide concrete thrust blocks and restrained joints with gripper wedges incorporated into a follower gland and specifically designed for the pipe material and meeting the requirements of AWWA C110/A21.10.

2.3 VALVES

2.3.1 Gate Valves

For knife gate valve on GWCP system, see valve standard V4S2AR, stainless steel, bonneted type.

For wedge gate valves on fire protection pipes, see valve standard V1J2FA unless indicated on drawings otherwise.

2.3.2 Air Release, Air/Vacuum, and Combination Air Valves

Provide air release that release air and prevent the formation of a vacuum, are in compliance with the provisions of AWWA C512 and are the size shown. Provide valves with an iron body, lead-free bronze trim and stainless steel float that automatically releases air when the lines are being filled with water and admits air into the line when water is being withdrawn in excess of the inflow.

2.4 FIRE HYDRANTS AND HOSE HOUSES

2.4.1 Fire Hydrants

Provide hydrants where indicated. Paint hydrants with at least one coat of primer and two coats of enamel paint. Paint barrel and bonnet colors in accordance with UFC 3-600-01. Stencil hydrant number and main size on the hydrant barrel using black stencil paint.

2.4.1.1 Dry-Barrel Type Fire Hydrants

Provide Dry-barrel type hydrants, AWWA C502 or UL 246, "Base Valve" design, with 6 inch inlet, 5 1/4 inch valve opening, one 4 1/2 inch pumper connection, and two 2 1/2 inch hose connections. Provide flanged joint to HDPE fire protection water pipe. Provide hydrants with frangible sections as mentioned in AWWA C502. Hydrant is to be fully operational under normal conditions.

2.5 ACCESSORIES

2.5.1 Tapping Sleeves

Provide stainless steel, split-sleeve type tapping sleeves of the sizes indicated for connection to existing main with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Utilize similar metals for bolts, nuts, and washers to minimize the possibility of galvanic corrosion. Provide dielectric gaskets where dissimilar metals adjoin. Construction is to be compatible with a maximum working pressure of 150 psi. Provide bolts with square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, utilize an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pre-torqued to 50 foot-pound.

2.5.2 Tracer Wire for Nonmetallic Piping

Provide bare copper or aluminum wire not less than 0.10 inch in diameter in

sufficient length to be continuous over each separate run of nonmetallic pipe.

2.6 DISINFECTION

For potable water and fire protection water pipes. Chlorinating materials are to conform to: Chlorine, Liquid: AWWA B301; Hypochlorite, Calcium and Sodium: AWWA B300.

PART 3 EXECUTION

3.1 PRECAUTIONS

3.1.1 Connections to Existing System

Perform all connections to the existing water system in the presence of the a designated representative of the Prime Contractor.

3.1.2 Operation of Existing Valves

Do not operate valves within or directly connected to the existing water system unless expressly directed to do so by the Prime Contractor.

3.2 INSTALLATION OF PIPELINES

3.2.1 General Requirements for Installation of Pipelines

Submit manufacturer's instructions for pipeline installations. These manufacturer's instructions apply to all pipeline installation except as noted herein.

3.2.1.1 Location

Do not lay water lines in the same trench with gas lines, electric wiring, or any other utility.

Where piping is required to be installed within 3 feet of existing structures, sleeve the water pipe. Provide ductile-iron or Schedule 40 steel sleeves. Fill annular space between pipe and sleeves with mastic. Install the water pipe and sleeve ensuring that there will be no damage to the structures and no settlement or movement of foundations or footings.

3.2.1.1.1 Potable and Fire Protection Water Piping Installation Parallel With Sewer Piping

3.2.1.1.1.1 Normal Conditions

Lay water piping at least 10 feet horizontally from a sewer or sewer manhole whenever possible. Measure the distance edge-to-edge. Provide at least 18 inches above the top (crown) of the sewer piping and the bottom (invert) of the water piping.

3.2.1.1.2 Installation of Water Piping Crossing Sewer Piping

- a. Provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping in cases where water piping crosses above sewer piping.

3.2.1.2 Earthwork

Perform earthwork operations in accordance with Section 31 00 00.04 EARTHWORK.

3.2.1.3 Pipe Laying and Jointing

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Under no circumstances is it permissible to drop or dump pipe, fittings, valves, or other water line material into trenches. Cut pipe cleanly, squarely, and accurately to the length established at the site and work into place without springing or forcing. Replace a pipe or fitting that does not allow sufficient space for installation of jointing material. Blocking or wedging between bells and spigots is not permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at the design elevation and grade. Secure firm, uniform support. Wood support blocking is not permitted. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports for fastening work into place. Make provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been assembled. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation.

3.2.1.4 Installation of Tracer Wire

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

3.2.1.5 Connections to Existing Lines

Make connections to existing lines after coordination with the facility and with a minimum interruption of service on the existing line. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped and as indicated, except as otherwise specified, tap concrete pipe in accordance with AWWA M9 for tapping concrete pressure pipe.

3.2.1.6 Penetrations

Provide ductile-iron or Schedule 40 steel wall sleeves for pipe passing through walls of valve pits and structures. Fill annular space between walls and sleeves with rich cement mortar. Fill annular space between pipe and sleeves with mastic.

3.2.2 Special Requirements for Installation

3.2.2.1 Installation of Ductile-Iron Piping

Unless otherwise specified, install pipe and fittings in accordance with the paragraph GENERAL REQUIREMENTS FOR INSTALLATION OF PIPELINES and with the requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

- a. Jointing: Make push-on joints with the gaskets and lubricant specified for this type joint. Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint. Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a flanged joint as specified, replace it. Use setscrew flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the setscrew flange manufacturer. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer. Assemble insulating joints as specified for flanged joints, except that bolts with insulating sleeves are to be full size for the bolt holes. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.
- b. Allowable Deflection: Follow [AWWA C600](#) for the maximum allowable deflection. If the alignment requires deflection in excess of the above limitations, provide special bends or a sufficient number of shorter lengths of pipe to achieve angular deflections within the limit set forth.
- c. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using [high density](#) polyethylene film, in accordance with [AWWA C105/A21.5](#).

3.2.2.2 Installation of PVC Water Main Pipe

Unless otherwise specified, install pipe and fittings in accordance with the paragraph GENERAL REQUIREMENTS FOR INSTALLATION OF PIPELINES; with the requirements of [AWWA C605](#) for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in [AWWA M23](#), Chapter 7, "Installation."

- a. Jointing: Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use a lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of [AWWA C605](#) for laying the pipe and the recommendations in [AWWA M23](#), Chapter 7, "Installation," for pipe joint assembly. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the requirements of [AWWA C605](#) for joining PVC pipe to fittings and accessories and with the requirements of [AWWA C600](#) for joint assembly. Make compression-type joints/mechanical joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint; assemble in accordance with the

requirements of AWWA C605 for joining PVC pipe to fittings and accessories, with the requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111/A21.11. Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

- b. Offset: Maximum offset in alignment between adjacent pipe joints as recommended by the manufacturer and not to exceed 5 degrees.
- c. Fittings: Install in accordance with AWWA C605.

3.2.2.3 Pipe Anchorage Installation

- a. Provide thrust blocks where indicated. Use concrete, ASTM C94/C94M, having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, two and one half parts sand, and five parts gravel, having the same minimum compressive strength.
- b. Provide restrained joints in accordance with NFPA 24, Chapter 10 and in accordance with ASTM F1674.
- c. For metal harness use tie rods and clamps as shown in NFPA 24. Provide metal harness fabricated by the pipe manufacturer and furnished with the pipe.

3.2.3 Installation of Valves

3.2.3.1 Installation of Gate Valves

Install gate valves, AWWA C500 and UL 262, in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to AWWA C500. Install gate valves, AWWA C509 or AWWA C515, in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to AWWA C509 or AWWA C515. Install gate valves on PVC water mains in accordance with the recommendations for appurtenance installation in AWWA M23, Chapter 7, "Installation." Make and assemble joints to gate valves as specified for making and assembling the same type joints between pipe and fittings.

3.2.3.2 Installation of Air Release Valves

Install pressure vacuum assemblies of type, size, and capacity indicated. Include valves and test cocks. Install according to the requirements of plumbing and health department and authorities having jurisdiction.

3.2.4 Installation of Fire Hydrants

Install hydrants in accordance with AWWA C600 for hydrant installation and as indicated. Make and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Provide metal harness as specified under pipe anchorage requirements for the respective pipeline material to which hydrant is attached. Install hydrants with the 4 1/2 inch connections facing the adjacent road or access path.

3.2.5 Installation of Backflow Preventers

Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction. Support backflow preventers, valves, and piping near floor with 12 inch minimum air gap, and on concrete piers or steel pipe supports. Do not install backflow preventers that have a relief drain in vault or in other spaces subject to flooding. Do not install by-pass piping around backflow preventers.

3.2.6 Disinfection

Disinfection of systems supplying non-potable water is not required.

Prior to disinfection, provide [disinfection procedures](#), proposed neutralization and disposal methods of waste water from disinfection procedures as part of the disinfection submittal. Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with [AWWA C651](#). Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 and 0.5 parts per million, or the residual chlorine content of domestic water supply. Obtain at least two consecutive bacteriological samples from new water piping. Analyze samples by a certified laboratory, and submit the results of the [bacteriological samples](#). Obtain approval by the Contracting Officer prior to the new water piping being placed into service.

3.3 FIELD QUALITY CONTROL

3.3.1 Field Tests and Inspections

Notify the [Prime Contractor](#) a minimum of five days in advance of hydrostatic testing. Coordinate the proposed method for disposal of waste water from hydrostatic testing. Perform field tests, and provide labor, equipment, and incidentals required for testing. Provide documentation that all items of work have been constructed in accordance with the Contract documents. Do not begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least five days after placing of the concrete. After installation conduct [Backflow Preventer Tests](#) and provide test reports verifying that the installation meets the [FCCCHR Manual](#) Standards.

3.3.2 Testing Procedure

3.3.2.1 Hydrostatic Testing

Test [each pipe](#) system in accordance with the applicable specified standard. Where water mains provide fire service, test in accordance with the special testing requirements given in the paragraph SPECIAL TESTING REQUIREMENTS FOR FIRE SERVICE. Test ductile-iron water mains in accordance with the requirements of [AWWA C600](#) for hydrostatic testing. No leakage will be allowed at joints made by flanged methods. Test PVC plastic water systems in accordance with the requirements of [AWWA C605](#) for pressure and leakage tests. The amount of leakage on pipelines made of PVC plastic water main pipe is not to exceed the amounts given in [AWWA C605](#), except that at joints made with sleeve-type mechanical couplings, no leakage will

be allowed. Test steel pipes in accordance with applicable requirements of AWWA C600 for hydrostatic testing. The amount of leakage on steel pipelines with rubber-gasketed bell-and-spigot joints is not to exceed 20 gallons per 24 hours per inch of pipe diameter per mile of pipeline; no leakage will be allowed at joints made by any other method. Repair of welded joints to stop leakage is to be done by welding only.

3.3.2.2 Leakage Testing

For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

For PE perform leak testing in accordance with ASTM F2164.

3.3.3 Special Testing Requirements for Fire Service

Test water mains and water service lines providing fire service or water and fire service in accordance with NFPA 24. The additional water added to the system must not exceed the limits given in NFPA 24



3.3.4 Tracer Wire Continuity



Test tracer wire for continuity after service connections have been completed and prior to final pavement or restoration. Verify that tracer wire is locatable with electronic utility locating equipment. Repair breaks or separations and re-test for continuity.



3.4 CLEANUP

Upon completion of the installation of water lines and appurtenances, remove all debris and surplus materials resulting from the work.

-- End of Section --

FLUID SERVICE				DESIGN PRESSURE	DESIGN TEMP.	pH	CORR. ALLOW.	INSUL. CODE	SERVICE CAT.	APPLICABLE CODE	REV
BWR - Backwash Return - Buried				0 to 100 psig	0 to 73 °F	5 to 9	0"		Category D	ASME B31.3	
FT - Filtrate - Buried				0 to 100 psig	0 to 73 °F	5 to 9	0"		Category D	ASME B31.3	
GW - Ground Water - Buried				0 to 100 psig	0 to 73 °F	5 to 9	0"		Category D	ASME B31.3	
LP - Lined Pond Water - Buried				0 to 100 psig	0 to 73 °F	2.6 to 3.8	0"		Category D	ASME B31.3	
MW - Mine Water - Buried				0 to 100 psig	0 to 73 °F	2.6 to 3.8	0"		Category D	ASME B31.3	
TE - Thickener Effluent - Buried				0 to 100 psig	0 to 73 °F	5 to 9	0"		Category D	ASME B31.3	
W3 - Plant Effluent Water - Buried				0 to 100 psig	0 to 73 °F	8 to 8.5	0"		Category D	ASME B31.3	
WS - Waste Sludge - Buried				0 to 100 psig	0 to 73 °F	5 to 9	0"		Category D	ASME B31.3	
ITEM	SIZE	MATERIAL	MFG. METHOD	MATERIAL SPECIFICATION		PRESS. CLASS/ WALL THICK.		END PREP/ GASKET CODE	SPECIFICATION	NOTES *	REV
Pipe	2" - 36"	HDPE (DR-PR)	Pressure Pipe	PE 4710		(See table for wall thickness)		Plain end - butt fusion	ASTM D3035/F714	6,7	
Fittings	2" - 4"	HDPE	Pressure Fittings, Molded	PE 4710 --		(To suit pipe pressure rating)		Socket Fusion	ASTM D2683		
	2" - 8"	HDPE	Pressure Fittings, Molded	PE 4710 --		(To suit pipe pressure rating)		Plain end - butt fusion	ASTM D3261	8	
	3" - 36"	HDPE (DR-PR)	Pressure Fittings, Fabricated	PE 4710 --		(To suit pipe pressure rating)		Thermal butt fusion	ASTM D3035/F714	8	
Flanges	2" - 36"	Ductile Iron Back-up		ASTM A536 Gr. 65-45-12		150		Loose	ASME B16.42	9	
	4" - 8"	Ductile Iron Adapter (HDPE x flange)	-	ASTM A395 / ASTM A536 Gr. 65-45-12 Victaulic Style 994 or app.equal		150		Plain end	ASME B16.5		
Joining Methods	All Sizes	Polyethylene	Thermal Fusion	--	--	(To suit pipe pressure rating)		Plain ends	ASTM D2657		
Stub End	3" - 36"	HDPE		PE 4710		(To suit pipe pressure rating)		Thermal butt fusion/flanged	ASTM D3261	9	
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Piping Design Standard									PPE2BW	0	

ITEM	SIZE	MATERIAL		MFG. METHOD	MATERIAL SPECIFICATION	PRESS. CLASS/ WALL THICK.	END PREP/ GASKET CODE	SPECIFICATION	NOTES *	REV
Bolts	All Sizes	Carbon Steel Semi-finished heavy hex			ASTM A307 GR B			ASME B18.2.1, B1.1 Class 2A		
Nuts	All Sizes	Carbon Steel Semi-finished heavy hex			ASTM A563 GR A			ASME B18.2.2, B1.1 Class 2B		
Couplings	2" - 12"	Ductile Iron Transition (HDPE to grooved IPS)	-		ASTM A395 / A536 Gr. 65-45-12 Victaulic Style 997 or app.equal		Plain end / groove			
	2" - 20"	Ductile Iron HDPE x HDPE	-		ASTM A395 / ASTM A536 Gr. 65-45-12 Victaulic Style 995N or app.equal		Plain ends			
	14" - 20"	Ductile Iron Transition (HDPE to grooved IPS)	-		ASTM A536 Gr. 65-45-12 Victaulic Style 995T or app.equal		Plain end x grooved			
Gaskets	All Sizes	EPDM rubber -	-		Garlock 8314 or app.equal	150 Full Face 1/8"	GH22C	ASME B16.21		
	All Sizes	EPDM rubber -	-		Garlock 8314 or app.equal	150 Raised Face 1/8"	GH25C	ASME B16.21		
ITEM	SIZE	TYPE	MATERIAL		ITEM CODE	PRESSURE CLASS	END PREP	NOTES *	REV	
Valves	1" - 2"	Air Vent, Discharge & Intake	Double Orifice, 304 SS Body 304 SS, ABS, HDPE Trim		V9S4TA	400	Threaded MNPT			
	3" - 8"	Air Vent, Discharge & Intake	Double Orifice, 304 SS Body 304 SS, ABS, HDPE Trim		V9S2FA	150	Flanged			
	1/2" - 2"	Ball	Reduced Port, Cast Carbon Steel Body SS Trim, Lever		V6C8TA	1500 CWP	Threaded	10		
	2 1/2" - 6"	Butterfly	Lug Type, Cast Iron Body, Epoxy Coated Exterior Ductile Iron Trim, Lever		V7J2AM	150	Lugged	11,10		
	8" - 36"	Butterfly	Lug Type, Cast Iron Body, Epoxy Coated Exterior Ductile Iron Trim, Gear		V7J2AN	150	Lugged	11		
	1/2" - 2"	Check	Swing Y-Pattern, Malleable Iron Body Malleable Iron Trim		V3J3TA	300	Threaded			
	2 1/2" - 6"	Gate	Wedge, Cast Iron Body Cast Iron Trim, Wheel		V1J1FH	125	Flanged	12		
			<div><div></div><div>US Army Corps of Engineers®</div></div>		amec foster wheeler 		PROJ. APPR. --	PROJECT ISSUE DATE 08-Dec-2017	PROJECT NUMBER 194043	PAGE 2 / 3
			Piping Design Standard			DEPT. APPR.	GENERIC APPR. DATE	DOCUMENT NUMBER PPE2BW	REV. 0	

ITEM	SIZE	TYPE	MATERIAL	ITEM CODE	PRESSURE CLASS	END PREP	NOTES *	REV
	2" - 24"	Knife Gate	Bonneted - Resilient Seat, Cast or Fabricated Body 316 SS Trim, Wheel	V4S2AR	150	Lugged		
Strainers	1/2" - 20"	Y-Type	Cast Carbon Steel	S1C2FB	150	Flanged		
Instructions								REV
SECTION 40 05 13.04 PIPELINES, LIQUID PROCESS PIPING								
Notes * Note #'s may change from one revision to the next of this document								REV
<div>1. All listed specifications and standards shall conform to the latest edition.</div> <div>2. High density polyethylene material shall meet ASTM D3350 PE445474C (PE 4710).</div> <div>3. Installation of HDPE piping shall conform to ASTM F-645, D2774 and manufacturer's installation guidelines.</div> <div>4. Washers shall be installed under all bolt heads and nuts on plastic flanges.</div> <div>5. For elevated pipe 3" NPS or less, continuously support pipe in tray or angle supports.</div> <div>6. Wall thickness (or Dimension Ratio) specified below (PE 4710, based on 73°F (23°C)):</div> <div><div><div>PRESSURE RATING (psi)</div><div>(kPa)</div><div>DR (Diameter/wall thickness)</div><div>MAX. DIAMETER (inches)</div></div><div><div>100</div><div>690</div><div>21</div><div>63</div></div><div><div>125</div><div>862</div><div>17</div><div>54</div></div><div><div>138</div><div>952</div><div>15.5</div><div>54</div></div><div><div>160</div><div>1103</div><div>13.5</div><div>42</div></div><div><div>200</div><div>1379</div><div>11</div><div>36</div></div><div><div>250</div><div>1724</div><div>9</div><div>32</div></div><div><div>317</div><div>2186</div><div>7.3</div><div>26</div></div><div><div>333</div><div>2296</div><div>7.0</div><div>24</div></div></div> <div>7. Pipe wall thickness is based on internal pressure only. For underground (buried) services, the thickness shall be determined for soil load and live surface loads on a case by case basis.</div> <div>8. Use plain end HDPE fittings, unless otherwise noted on project drawings.</div> <div>9. Use HDPE stub-ends complete with slip-on ductile iron flanges, unless otherwise noted on project drawings.</div> <div>10. All quarter turn valves with lever must be supplied with locking device.</div> <div>11. Reduce pressure rating of this valve by 50% when used for dead end service where one of the mating flanges may be removed while the valve is pressurized.</div> <div>12. Use gate valves only where indicated on the P&ID. Use butterfly valve for primary block valve.</div>								
			<div><div>US Army Corps of Engineers®</div></div>	amec foster wheeler 	PROJ. APPR. --	PROJECT ISSUE DATE 08-Dec-2017	PROJECT NUMBER 194043	PAGE 3 / 3
			Piping Design Standard		DEPT. APPR.	GENERIC APPR. DATE	DOCUMENT NUMBER PPE2BW	REV. 0

7. Pipe wall thickness is based on internal pressure only. For underground (buried) services, the thickness shall be determined for soil load and live surface loads on a case by case basis.

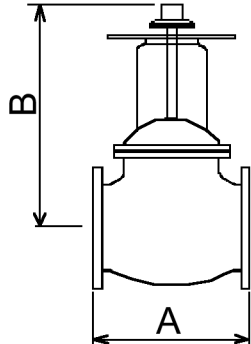


8. Use plain end HDPE fittings, unless otherwise noted on project drawings.

9. Use HDPE stub-ends complete with slip-on ductile iron flanges, unless otherwise noted on project drawings.

10. All quarter turn valves with lever must be supplied with locking device.

11. Reduce pressure rating of this valve by 50% when used for dead end service where one of the mating flanges may be removed while the valve is pressurized.

12. Use gate valves only where indicated on the P&ID. Use butterfly valve for primary block valve.

TYPE:		GATE - WEDGE		CLASS: 175									
				CAST IRON BODY - BRONZE TRIM, SQ.NUT, UL LISTED, FM APPROVED									
SERVICE:				Fire Protection Water									
MATERIALS / CONSTRUCTION: END CONN: Flanged BONNET: Bolted OPERATOR: 2" Sq. Wrench Nut STEM: Non-Rising - Inside Screw BODY: Cast Iron ASTM A126 CL.B SEAT: Bronze - Screwed In SEALS: -- PACKING: O-Ring Stuffing Box PLUG: -- BALL: -- DISC: Resilient - Cast Iron, Rubber Coated SPRING: -- DIAPHRAGM -- GATE: --				NPS	A	B	C	D	E				
				1/4	--	--							
				3/8	--	--							
				1/2	--	--							
				3/4	--	--							
				1	--	--							
				1 1/4	--	--							
				1 1/2	--	--							
				2	7	11							
				2 1/2	7 1/2	12							
				3	8	13							
				4	9	15							
				5	--	--							
				6	10 1/2	19							
				8	11 1/2	23							
				10	13	27							
				12	14	30							
				14	15	38							
				16	16	38							
				18	--	--							
				20	--	--							
				24	--	--							
				PRESSURE/TEMPERATURE RATING: <u>IMPERIAL:</u> 200 psig at cold water °F 150 psig at cold water °F psig at °F psig at °F <u>METRIC:</u> 1379 kPa(g) at °C 1034 kPa(g) at °C kPa(g) at °C kPa(g) at °C				30	--	--			
								36	--	--			
								42	--	--			
								48	--	--			
CODE / REGULATIONS / NOTES: 1. Dimensions vary with each supplier - see manufacturer's catalogue. 2. UL listed & FM approved. 3. Size 2" to 12" 200 psig at 32 to 100°F Size 14" & up 150 psig at 32 to 100°F 4. Recommended Valve Manufacturers are Crane/McAvity, Jenkins, Kennedy, Mueller, Nibco or approved equal.													
Note: Dimensions are composite and for approximate clearance only. For construction, use manufacturer's catalogue or drawing.													
													
GATE / CLASS 175 / CAST IRON BODY / FLANGED													
 US Army Corps of Engineers®		amec foster wheeler 		PROJ. APPR.		PROJECT ISSUE DATE		PROJECT NUMBER					
				PRELIMINARY		10-Oct-2017		194043					
Valve Standard				DEPT. APPR.		GENERIC APPR. DATE		VALVE NUMBER		REV.			
								V1J2FA		A			

SECTION 33 40 00.04

STORM DRAINAGE UTILITIES

02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 294 (2017) Standard Specification for
Corrugated Polyethylene Pipe, 300- to
1500-mm (12- to 60-in.) Diameter

ASTM INTERNATIONAL (ASTM)

ASTM A48/A48M (2003; R 2012) Standard Specification for
Gray Iron Castings

ASTM A536 (1984; R 2014) Standard Specification for
Ductile Iron Castings

ASTM B26/B26M (2014; E 2015) Standard Specification for
Aluminum-Alloy Sand Castings

ASTM C270 (2014a) Standard Specification for Mortar
for Unit Masonry

ASTM C443 (2012; R 2017) Standard Specification for
Joints for Concrete Pipe and Manholes,
Using Rubber Gaskets

ASTM C478 (2015a) Standard Specification for Precast
Reinforced Concrete Manhole Sections

ASTM C923 (2008; R 2013; E 2016) Standard
Specification for Resilient Connectors
Between Reinforced Concrete Manhole
Structures, Pipes and Laterals

ASTM C990 (2009; R 2014) Standard Specification for
Joints for Concrete Pipe, Manholes and
Precast Box Sections Using Preformed
Flexible Joint Sealants

ASTM D1056 (2014) Standard Specification for Flexible
Cellular Materials - Sponge or Expanded
Rubber

ASTM D1171 (2016; E 2016) Standard Test Method for
Rubber Deterioration - Surface Ozone

	Cracking Outdoors (Triangular Specimens)
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³) (2700 kN-m/m ³)
ASTM D1784	(2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D2321	(2014; E 2014) Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D2729	(2011) Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3034	(2016) Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3350	(2012) Polyethylene Plastics Pipe and Fittings Materials
ASTM D6938	(2017) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM F679	(2016) Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-04 Samples

Pipe for Culverts and Storm Drains

SD-07 Certificates

Resin Certification

Oil Resistant Gasket

Hydrostatic Test on Watertight Joints

Determination of Density

Frame and Cover for Gratings

SD-08 Manufacturer's Instructions

Placing Pipe

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.3.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

2.1.1 Poly Vinyl Chloride (PVC) Pipe

Submit the pipe manufacturer's resin certification, indicating the cell classification of PVC used to manufacture the pipe, prior to installation of the pipe.

2.1.1.1 Type PSM PVC Pipe

ASTM D3034, Type PSM, maximum SDR 35, produced from PVC certified by the Manufacturer as meeting the requirements of ASTM D1784, minimum cell class 12454-B.

2.1.1.2 Smooth Wall PVC Pipe

ASTM F679 produced from PVC certified by the Manufacturer as meeting the requirements of ASTM D1784, minimum cell class 12454-B.

2.1.2 Polyethylene (PE) Pipe

Submit the pipe manufacturer's resin certification, indicating the cell classification of PE used to manufacture the pipe, prior to installation of the pipe. The minimum cell classification for polyethylene plastic shall apply to each of the seven primary properties of the cell classification limits in accordance with ASTM D3350.

Bunker Hill - CTP Upgrades

2.1.2.1 Corrugated PE Pipe

AASHTO M 294, Type S. For slow crack growth resistance, acceptance of resins shall be determined by using the notched constant ligament-stress (NCLS) test meeting the requirements of AASHTO M 294.

2.2 PERFORATED PIPING

2.2.1 Polyvinyl Chloride (PVC) Pipe

ASTM D2729.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C270, Type M, except that the maximum placement time shall be 1 hour. Water shall be clean and free of harmful acids, alkalis, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

2.3.2 Precast Reinforced Concrete Manholes

Conform to ASTM C478. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure.

2.3.3 Frame and Cover for Gratings

Submit certification on the ability of frame and cover or gratings to carry the imposed live load. Frame and cover for gratings shall be cast gray iron, ASTM A48/A48M, Class 35B; cast ductile iron, ASTM A536, Grade 65-45-12; or cast aluminum, ASTM B26/B26M, Alloy 356.O-T6. Weight, shape, size, and waterway openings for grates shall be as indicated on the plans. The word "Storm Sewer" shall be stamped or cast into covers so that it is plainly visible.

2.3.4 Joints

2.3.4.1 Flexible Watertight Joints

- a. Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe. The design of joints and the physical requirements for preformed flexible joint sealants shall conform to ASTM C990, and rubber-type gaskets shall conform to ASTM C443. Gaskets shall have not more than one factory-fabricated splice.
- b. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C443. Certified copies of test results shall be delivered to the Prime Contractor before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

2.3.4.2 Flexible Watertight, Gasketed Joints

- a. Gaskets: For the drainage system of POL containment pad, the couplings are required to have gaskets. The closed-cell expanded rubber gaskets shall be a continuous band approximately 7 inches wide and approximately 3/8 inch thick, meeting the requirements of ASTM D1056, Type 2, and shall have a quality retention rating of not less than 70 percent when tested for weather resistance by ozone chamber exposure, Method B of ASTM D1171. Rubber O-ring gaskets shall be 13/16 inch in diameter for pipe diameters of 36 inches or smaller. Rubber O-ring gaskets shall be 1-3/8 inches in diameter for pipe having 1 inch deep end corrugations. O-rings shall meet the requirements of ASTM C990 or ASTM C443. Preformed flexible joint sealants shall conform to ASTM C990, Type B.
- b. Connecting Bands: Connecting bands shall be of the type, size and sheet thickness of band, and the size of angles, bolts, rods and lugs as indicated or where not indicated as specified in the applicable standards or specifications for the pipe. Exterior rivet heads in the longitudinal seam under the connecting band shall be countersunk or the rivets shall be omitted and the seam welded. Watertight joints shall be tested and shall meet the test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS.

2.3.4.3 PVC Plastic Pipes

Joints shall be solvent cement or elastomeric gasket type in accordance with the specification for the pipe and as recommended by the pipe manufacturer.

2.4 RESILIENT CONNECTORS

Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C923.

2.5 EROSION CONTROL RIP RAP

Provide non-erodible rock as indicated.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of Section 31 00 00.04 EARTHWORK and the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 6 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheet piling and bracing, where required, shall be placed within the trench width as specified, without any overexcavation. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Prime Contractor.

3.1.2 Removal of Rock

Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches but not more than three-fourths the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe.

3.1.3 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Prime Contractor, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Prime Contractor.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Plastic Pipe

Bedding for PVC and PE pipe shall meet the requirements of ASTM D2321. Use Class IB or II material for bedding, haunching, and initial backfill. Use Class I, II, or III material for PP pipe bedding, haunching and initial backfill.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe, excluding SRPE pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated pipe shall be placed in the same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. Deflection of installed flexible pipe shall not exceed the following limits:

TYPE OF PIPE	MAXIMUM ALLOWABLE DEFLECTION (percent)
Plastic (PVC and PE)	5

3.3.1 PVC Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

3.3.2 PE Dual Wall Pipe

Laying shall be with the separate sections joined firmly on a bed shaped to line and grade and shall follow manufacturer's guidelines.

3.4 DRAINAGE STRUCTURES

3.4.1 Sump

Construction shall be of precast reinforced concrete, complete with frames and covers or gratings; and with fixed galvanized steel ladders where indicated. Pipe connections to concrete manholes shall be made with flexible, watertight connectors.

3.5 STEEL LADDER INSTALLATION

Ladder shall be adequately anchored to the wall by means of steel inserts and shall be installed to provide at least 6 inches of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

3.6 BACKFILLING

3.6.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe for flexible pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 8 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.6.2 Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 8 inches. Use select granular material for this entire region of backfill for flexible pipe installations.

3.6.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.6.4 Compaction

3.6.4.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.6.4.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted as indicated on the Drawings.

3.7 FIELD QUALITY CONTROL

3.7.1 Tests

Testing is the responsibility of the Contractor. Perform all testing and retesting at no additional cost to the Prime Contractor.

3.7.1.1 HYDROSTATIC TEST ON WATERTIGHT JOINTS

For the POL containment pad drainage system, watertight joints shall be used on the upstream of the gate valve. Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of [ASTM C443](#). Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed.

3.7.1.2 Determination of Density

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with [ASTM D1557](#) except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with [ASTM D6938](#). The calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. [ASTM D6938](#) results in a wet unit weight of soil and [ASTM D6938](#) shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in [ASTM D6938](#). Test results shall be furnished the Prime Contractor. The calibration checks of

both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

3.7.2 Inspection

3.7.2.1 Post-Installation Inspection

Visually inspect each segment of pipe for alignment, settlement, joint separations, soil migration through the joint, cracks, buckling, bulging and deflection. If pipe does not appear round all the way to the next structure, Contractor shall perform excavation to conduct repairs. An engineer must evaluate all defects to determine if any remediation or repair is required.

3.7.3 Repair Of Defects

3.7.3.1 Leakage Test

When leakage exceeds the maximum amount specified, correct source of excess leakage by replacing damaged pipe and gaskets and retest.

3.7.3.2 Inspection

Replace pipe or repair defects that have been observed.

3.7.3.2.1 Flexible Pipe

Replace pipes having cracks or splits.

3.8 PROTECTION

Protect storm drainage piping and adjacent areas from superimposed and external loads during construction.

3.9 WARRANTY PERIOD

Pipe segments found to have defects during the warranty period must be replaced with new pipe and retested.

-- End of Section --

SECTION 33 46 13.04

FOUNDATION DRAINAGE SYSTEM

04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C33/C33M	(2016) Standard Specification for Concrete Aggregates
ASTM D3034	(2016) Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	(2007; R 2013) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F758	(2014) Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F949	(2015) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

1.2 SYSTEM DESCRIPTION

1.2.1 Extent

Furnish and install foundation drainage as a complete system for the existing maintenance building.

1.2.2 Outlet Connections

Foundation pipe shall be connected to the storm drainage system as shown.

1.2.3 Drainage Lines

Construct drainage lines of perforated pipe.

1.2.4 Outlet Lines

Construct outlet lines of closed-joint nonperforated, nonporous pipe.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-04 Samples

Materials.

SD-07 Certificates

Materials.

1.4 DELIVERY, STORAGE, AND HANDLING

Protect materials placed in storage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Do not expose plastic pipe to direct sunlight for more than 6 months from time of manufacturer to installation.

PART 2 PRODUCTS

2.1 MATERIALS

Pipe for foundation drainage system shall be of the type and size indicated. Use appropriate transitions, adapters, or joint details where pipes of different types or materials are connected. Submit two randomly selected samples of each type of pipe and fitting, prior to delivery of materials to the site, and certifications from the manufacturers attesting that materials meet specification requirements.

2.1.1 Plastic Pipe

Plastic pipe shall contain ultraviolet inhibitor to provide protection from exposure to direct sunlight.

2.1.1.1 Polyvinyl Chloride (PVC) Pipe

ASTM F758, Type PS 46, ASTM D3034, or ASTM F949 with a minimum pipe stiffness of 46 psi.

2.1.1.2 Circular Perforations in Plastic Pipe

Circular holes shall be cleanly cut, not more than 5/16 inch or less than 3/16 inch in diameter, and arranged in rows parallel to the longitudinal axis of the pipe. Perforations shall be approximately 3 inches apart, center-to-center, along rows. The rows shall be approximately 1-1/2 inches apart and arranged in a staggered pattern so that all perforations lie at the midpoint between perforations in adjacent rows. The rows shall be spaced over not more than 155 degrees of circumference. The spigot or tongue end of the pipe shall not be perforated for a length equal to the depth of the socket and perforations shall continue at uniform spacing over the entire length of the pipe. Manufacturer's standard perforated pipe which essentially meets these requirements may be used with prior approval of the Contracting Officer.

2.1.2 Fittings

Fittings shall be of compatible materials for pipe, of corresponding weight and quality, and as specified herein.

2.1.3 Cleanouts and Piping Through Walls

Cleanout pipe and fittings and piping through walls and footings shall be cast-iron soil pipe. Each cleanout shall have a brass ferrule and a cast-brass screw-jointed plug with socket or raised head for wrench.

2.1.4 Cover and Wrapping Materials for Open Joints in Drain Tile

Cover material may be tar paper, roofing paper, reinforced building paper, glass fiber fabric, or other similar type material. Wrapping material shall be 18-14 mesh, 0.01 inch diameter nonferrous wire cloth.

2.1.5 Bedding and Pervious Backfill for Foundation Drains

Bedding and pervious backfill shall be coarse aggregate conforming to ASTM C33/C33M, size number 3, nominal size 2 to 1 inch.

2.1.6 Protective Covering for Pervious Backfill

Protective covering shall be minimum 6 ounce non-woven geotextile.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Trenching and Excavation

Perform required trenching and excavation in accordance with Section 31 00 00.04 EARTHWORK. Keep trenches dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends. Use wye fittings at intersections.

3.1.2 Bedding

Place graded bedding, minimum 6 inches in depth, in the bottom of trench for its full width and length compacted as specified prior to laying of foundation drain pipe. Each section shall rest firmly upon the bedding, through the entire length, with recesses formed for bell joints. Except for recesses for bell joints, the bedding shall fully support the lower quadrant of the pipe.

3.1.3 Pipe Laying

Lay drain lines to true grades and alignment with a continuous fall in the direction of flow. Bells of pipe sections shall face upgrade. Clean interior of pipe thoroughly before being laid. When drain lines are left open for connection to discharge lines, the open ends shall be temporarily closed and the location marked with wooden stakes. Perforated pipe shall be laid with perforations facing down. Any length that has had its grade or joints disturbed shall be removed and relaid at no additional cost to the Government. Perforated corrugated polyethylene drainage tubing and plastic piping shall be installed in accordance with manufacturer's specifications and as specified herein. Tubing and piping with physical imperfections shall not be installed.

3.1.4 Jointing

3.1.4.1 Perforated and Porous Pipes

Perforated and porous types of drain pipes shall be laid with closed joints.

3.1.4.2 PVC Pipe

PVC pipe joints shall be in accordance with ASTM D3034, ASTM D3212, or ASTM F949.

3.1.5 Outlet Lines

The outlet end of drain lines connecting with an outfall shall be finished as shown.

3.1.6 Cleanouts

Provide cleanouts in locations indicated. Cleanouts in unpaved areas shall be set in 12 by 12 by 4 inch concrete blocks.

3.2 BACKFILLING

After joints and connections have been inspected and approved, place the specified pervious backfill material a minimum width of 6 inches on each side of the pipe or tile and 6 inches above the top of the pipe. Place the backfill preventing displacement of or injury to the pipe or tile. Place a protective covering, as specified, over the pervious backfill for the full width of the trench before regular backfill is placed. Compact backfill as specified in Section 31 00 00.04 EARTHWORK.

-- End of Section --

APPENDIX C

Design Criteria and Verification Plan

DESIGN CRITERIA AND VERIFICATION PLAN

Process (Cont'd.)

No.: Project Title: Major Area: Discipline: Document Owner: Project Document No.: Revision No.: Revision Date:	W912DW-16-C-0012 Bunker Hill Central Treatment Plan Upgrade Central Treatment Plant Process V Khera DC-P-001 D October 20, 2017	Design Input	Design Output	Verification Method	Rev. No.
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WATER CHEMISTRY

BASE FLOW - STRENGTH CHEMISTRY

Chemistry implied by the SOW was estimated by blending mine water and groundwater as shown in the table below:

Parameter	Units	SOW Chemistry	Mine water ^(a)	Groundwater ^(b)	Base Flow Water Quality (1,300 gpm mine water (39%) + 2,000 gpm groundwater (61%)) ^(c)
Ag	µg/L		6.7	1.1	3.3
Al	µg/L		3,130	197	1,350
As	µg/L		22	30	27
Ba	µg/L		11	13	12
Be	µg/L		1.0	0.11	0.5
B	µg/L		6.7	37	25
Ca	µg/L		219,000	127,000	163,000
Cd	µg/L		124	50	79
Co	µg/L		92	18	47
Cu	µg/L		150	1.6	60
Fe	µg/L	41,000	79,000	16,400	41,100
Hg	µg/L		0.030	0.028	0.029
K	µg/L		6,490	5,600	5,950
Mg	µg/L		161,000	46,600	91,700
Mn	µg/L	47,000	102,000	11,800	47,300
Na	µg/L		226	2,860	1,820
Ni	µg/L		17	36	28
Pb	µg/L		599	3.4	238
Se	µg/L		9.4	3.7	5.9
SiO ₂	µg/L		13,200	21,400	18,170
Sr	µg/L		190	350	287
Tl	µg/L		0.74	0.75	0.75
Zn	µg/L		74,300	24,000	43,800
Sulfate	mg/L		1,310	488	812

Notes:

- ^(a) Bunker Hill AMD chemistry (BH-KT-01) - dissolved (Table B-11 of Appendix D (CH2M Pilot Report) of SOW)
- ^(b) OU2 groundwater quality (BH-SF-E-0429-U) - dissolved (Table B-11 of Appendix D (CH2M Pilot Report) of SOW)
- ^(c) Estimated by blending mine water and groundwater chemistries in the indicated ratio, which is based on flows specified in SOW Paragraph 3.1. Assumes that constituents do not react upon blending.

DESIGN CRITERIA AND VERIFICATION PLAN

Process (Cont'd.)



No.: Project Title: Major Area: Discipline: Document Owner: Project Document No.: Revision No.: Revision Date:	W912DW-16-C-0012 Bunker Hill Central Treatment Plan Upgrade Central Treatment Plant Process V Khera DC-P-001 D October 20, 2017	Design Input	Design Output	Verification Method	Rev. No.
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DESIGN FLOW - STRENGTH CHEMISTRY

Chemistry implied by the SOW was estimated by blending mine water and groundwater as shown in the table below:

Parameter	Units	SOW Chemistry	Mine water – max month ^(a)	Groundwater ^(b)	Max Flow Water Quality (5,500 gpm mine water (68.75%) + 2,500 gpm groundwater (31.25%)) ^(c)
Ag	µg/L		30	1.5	21
Al	µg/L		20,101	2,920	14,732
As	µg/L		1,848	31	1,280
Ca	µg/L		151,494	128,000	144,152
Cd	µg/L		1,065	56	750
Cu	µg/L		2,007	11	1,383
Fe	µg/L	357,000	510,105	19,900	356,916
Hg	µg/L		1.3	0	0.9
K	µg/L		6,209	5,670	6,041
Mg	µg/L		186,542	47,100	142,996
Mn	µg/L	116,000	162,797	13,100	116,017
Na	µg/L		1,991	2,900	2,275
Pb	µg/L		510	35	362
Se	µg/L		26	3.6	19
Tl	µg/L		68	0.8	47
Zn	µg/L		377,000	25,800	267,250
Sulphate	mg/L		3,848	488	2,798

Notes:

- ^(a) Max monthly mine water blend concentration - total (Table C-4 of Appendix D (CH2M Pilot Report) of RFP)
- ^(b) Assumed OU2 groundwater quality - total (Table C-4 of Appendix D (CH2M Pilot Report) of RFP)
- ^(c) Estimated by blending mine water and groundwater chemistries in the indicated ratio, which is based on flows specified in SOW Paragraph 3.1. Assumes that constituents do not react upon blending.

DESIGN AND VERIFICATION CODES

Design Input

A = Amec Foster Wheeler/
Recommendation
 C = Calculated
 E = Estimate
 N = Industry Standard (Practice)
 O = Other
 CL = Client
 T = Testwork Data
 V = Vendor Data

Principal Design Output

DS = Design & Material Standard/Spec'n
 PD = P&ID/P&C/flowsheet
 OL = One Line Diagram
 LD = Logic Description
 PS = Process Functional Specification
 SP = Site Plan & Facility Layout
 EL = Equipment Layout
 ES = Equipment Specification
 OT = Other Drawings
 CS = Construction Specifications

Verification Method

Ch = Checking
 DR = Design Review
 AC = Alternate Calculation
 CR = Constructability Review
 HA = HAZOP Study
 CE = Compare to existing
 LT = Lab Testing

DESIGN CRITERIA AND VERIFICATION PLAN

Process (Cont'd.)



No.: Project Title: Major Area: Discipline: Document Owner: Project Document No.: Revision No.: Revision Date:	W912DW-16-C-0012 Bunker Hill Central Treatment Plan Upgrade Central Treatment Plant Process V Khara DC-P-001 D October 20, 2017	Design Input	Design Output	Verification Method	Rev. No.
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CTP EFFLUENT DISCHARGE LIMITS

Parameters ^(a)	Units	Current Limits		Future Limits ^(b)	
		Maximum Daily Limit ^(c)	Average Monthly Limit ^(d)	Maximum Daily Limit ^(c)	Average Monthly Limit ^(d)
Cd	µg/L	100	50	5.53	2.76
Cu	µg/L	300	150	115	57
Pb	µg/L	600	300	32	16
Hg	µg/L	2.0	1.0	0.045	0.022
Zn	µg/L	1480	730	489	244
pH	std units	6.0-10.0		6.5-10.0	
TSS	mg/L	30	20	30	20
TSS-WLA ^(e)	Tons/yr	--		56.1	
Whole Effluent Toxicity		--		See table below	

TSS = total suspended solids

Notes:

- ^(a) Metals limits are as total recoverable metals except for mercury, which is in terms of total Hg.
- ^(b) According to *Central Treatment Plant (CTP) Discharge Requirements Technical Memorandum Bunker Hill Superfund Site*, EPA, February 2015.
- ^(c) Highest allowable daily discharge.
- ^(d) Sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. Referred to as Daily Average Limit in the 1986 permit.
- ^(e) In order to meet the substantive requirements of the Idaho TMDL for SFCDR Subbasin, the annual average waste load allocation (WLA) for TSS for the CTP will be 56.1 tons/year (*South Fork Coeur d'Alene River Sediment Subbasin Assessment and Total Maximum Daily Load*, IDEQ, 2001).

DESIGN AND VERIFICATION CODES

Design Input

A = Amec Foster Wheeler/
Recommendation
C = Calculated
E = Estimate
N = Industry Standard (Practice)
O = Other
CL = Client
T = Testwork Data
V = Vendor Data

Principal Design Output

DS = Design & Material Standard/Spec'n
PD = P&ID/P&C/flowsheet
OL = One Line Diagram
LD = Logic Description
PS = Process Functional Specification
SP = Site Plan & Facility Layout
EL = Equipment Layout
ES = Equipment Specification
OT = Other Drawings
CS = Construction Specifications

Verification Method

Ch = Checking
DR = Design Review
AC = Alternate Calculation
CR = Constructability Review
HA = HAZOP Study
CE = Compare to existing
LT = Lab Testing

DESIGN CRITERIA AND VERIFICATION PLAN

Process (Cont'd.)



No.: Project Title: Major Area: Discipline: Document Owner: Project Document No.: Revision No.: Revision Date:	W912DW-16-C-0012 Bunker Hill Central Treatment Plan Upgrade Central Treatment Plant Process V Khara DC-P-001 D October 20, 2017	Design Input	Design Output	Verification Method	Rev. No.
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CTP Whole Effluent Toxicity (WET) Trigger Values ^(a)		
River Flow Tier: Percentile of Flow in SFCDR at Elizabeth Park	River Flow: Flow in SFCDR at Elizabeth Park (cfs)	WET Trigger Value (TU _c)
<10 th	<71	2.4
10 th to <50 th	71 to <165	2.9
50 th to halfway between the 50 th and 90 th percentiles	165 to <508	5.4
Halfway between the 50 th and 90 th percentiles to <90 th	508 to <851	14.6
>90 th	≥851	23.8

TU_c = chronic toxic units = 100/IC₂₅, where IC₂₅ = 25% inhibition concentration
 cfs = cubic feet per second

Notes:

^(a) According to *Central Treatment Plant (CTP) Discharge Requirements Technical Memorandum, Bunker Hill Superfund Site*, EPA, February, 2015.

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Recommendation
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DESIGN CRITERIA AND VERIFICATION PLAN

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CENTRAL TREATMENT PLANT				
The plant will be designed for continuous service, 24 hours per day, seven days per week.	CL			A

DESCRIPTION	UNITS	DESIGN	COMMENTS				
Operating Basis							
Annual	months	12		CL			A
Daily	hrs/day	24		CL			A
Processing Rate							
Design Flow	gpm	8,000 (plus internal recirculation flow)	5,500 gpm groundwater, 2,500 gpm mine water. Mine flow more than 5,500 gpm will be diverted by others to in-mine storage.	CL	PD	Ch	A
Base Flow	gpm	3,300	2,000 gpm groundwater, 1,300 gpm mine water	CL	PD	Ch	A
Minimum Continuous Flow	gpm	1,800		A	PD	Ch	C
Design Flow -Filter System	gpm	5,000 (plus internal recirculation flow)	5,000 gpm expressed as CTP influent flow (excluding recycle flow)	CL	PD	Ch	C
Lime/Sludge Mix Tank							
Retention time	minutes	3	Based on Design Flow	A	OT	Ch	A

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Reactor Tanks							
Retention time (Total)	min	30	Based on Design Flow, Two Reactors	A	OT	Ch	A
Influent Oxygen Demand	lb/min (transferred)	5.7	Based on Design Flow, Calculated Stoichiometrically	E	PD	Ch	B
Aeration Rate (Total)	SCFM	1,650	Based on Design Flow, Calculated Stoichiometrically	E	PD	Ch	B
Clarifier Tank (Existing)							
Underflow Solids							
Underflow Density Design	% solids	5		A	PD	Ch	A
Operating Range	% solids	3-10		A	PD	Ch	A
Underflow Flowrate	gpm	1,000-2,400	Based on piping limitations (Expected)	E	PD	Ch	A
Lime							
Total Ca(OH) ₂ Dosage at pH 10	g/L	2.20	Design Flow Conditions	CL	ES	Ch	C
Total Ca(OH) ₂ Dosage at pH 10	g/L	0.21	Base Flow Conditions	CL	ES	Ch	C
Slurry density	wt%	10-20		CL	PD	Ch	A

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---	--	--------------	---------------	---------------------	----------

Sludge							
Maximum Sludge Generation Rate (Design) at pH 10	g/L	2.69	Design Flow Conditions	CL	PD	Ch	C
Design Mass Recycle Ratio (at Maximum Sludge Generation Rate)		6-12	Design Flow Conditions	E	PD	Ch	A
Base Conditions Sludge Generation Rate at pH 10	g/L	0.23	Base Flow Conditions	CL	PD	Ch	C
Expected Mass Recycle Ratio (at Base Case)		30 to 85	Base Flow Conditions	E	PD	Ch	A
Sludge Thickener							
Sludge Thickener Unit Area Loading (minimum)	sf/(ton/d)	7.2	Design Flow Conditions	A	PD	Ch	C
Sludge U/F Density	%	≥ 25	Design Flow Conditions	C	PD	Ch	C
Sludge viscosity	cP	50	Design Flow Conditions	A	DS	LT	D
Filtration							
Surface Loading Rate	gpm/ft ²	6.7	Based on Design Flow for Filtration	A	PD	Ch	D
Flocculant							
Consumption	mg/L	2.0-5.0		E	PD/ES	Ch	A
Flocculant concentration							
Make-up and storage	wt%	0.30-0.50		E	PD/ES	Ch	A
Feed to process	wt%	0.03-0.05	Fresh water dilution	E	PD/ES	Ch	A

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Operating pH							
Operating pH	pH	≥ 9	Reactor tank mixed liquor, existing clarifier overflow and underflow, thickener overflow and underflow (recycle and waste sludge), filtered water, and dirty backwash	A	DS	LT	D

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APPENDIX D

Civil Design Criteria



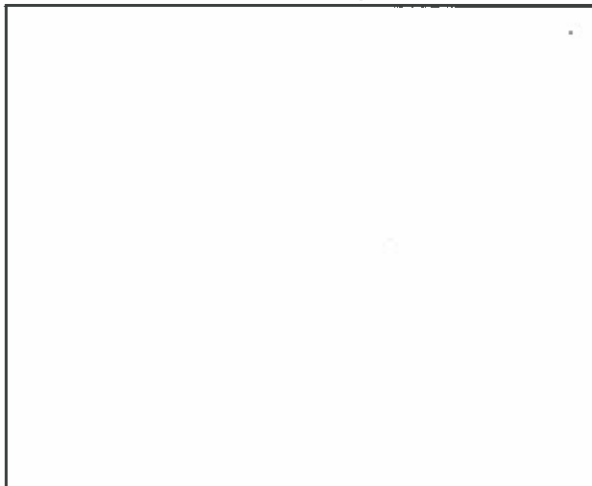
Design Criteria

Title:	Civil Design Criteria		
Project Doc. No.:	194043-700-DD10-DSC-001	Revision No.:	0
Project Name:	Bunker Hill – CTP Upgrades	Project No.:	194043
Client:	US Army Corps of Engineers	Plant/Area No.:	700

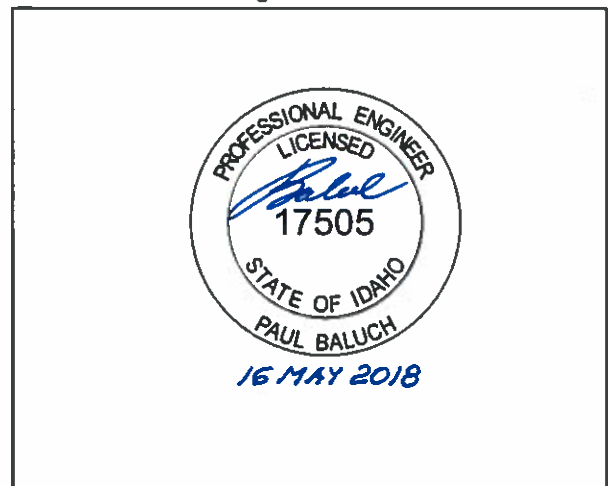
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Rev	Date	Issued For	Prepared	Checked	Approved	Client
A	17 July 2017	Issued for Review	A.Drake	H.Du		
B	18 July 2017	Re-issued for Review	H.Du	A.Drake		
C	13 Oct 2017	Updated for DP4	H.Du	A.Drake		
D	09 Feb 2018	Issued for Client Final Review	H.Du	P.Baluch		
0	14 May 2018	Issued for Design	H.Du	P.Baluch	A.Drake	

Permit Stamp



Engineer's Seal





Design Criteria

Title:	Civil Design Criteria		
Project Doc. No.:	194043-700-DD10-DSC-001	Revision No.:	0

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Design Criteria

Title:	Civil Design Criteria	
Project Doc. No.:	194043-700-DD10-DSC-001	Revision No.: 0

1 General

This document establishes the basic requirements and parameters for the demolition, yard process piping systems, earthworks, site roads, drainage facilities, and fire water main for the Bunker Hill Central Treatment Plant Project located in Kellogg, ID, US.

Civil design shall comply with these criteria. Items not covered herein shall conform to the USACE RFP Division 01, Section 01 10 00, Part 3.0 Functional Requirements and Performance Standards, and Part 5.5 Civil Design, and appropriate codes and standards.

2 Codes and Standards

Unless stated otherwise in this design criteria, all design, material and equipment manufacturing, fabrication, testing, installation and construction for this project shall be in accordance with the current version of the following standards: Project Standards

- ANSI/ASME B31.3 Process Piping
- ANSI/ASME B31.8 Gas Transmission and Distribution Piping Systems
- ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- ASTM D422 Standard Test Method for Particle Size Analysis of Soils
- ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 KN-m/m³))
- ASTM D1067 Standard Test Methods for Acidity or Alkalinity of Water
- ASTM D1140 Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-Micrometer) Sieve
- ASTM D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- ASTM D2216 Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
- ASTM D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
- ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
- ASTM D3559 Standard Test Methods for Lead in Water

Design Criteria

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- ASTM D3740 Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- ASTM-D3786 Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method
- ASTM D3977 Standard Test Methods for Determining Sediment Concentration in Water Samples
- ASTM D4253 Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
- ASTM-D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
- ASTM-D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
- ASTM-D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
- ASTM-D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile
- ASTM D6475 Standard Test Method for Measuring Mass Per Unit Area of Erosion Control Blankets
- ASTM D6525 Standard Test Method for Measuring Nominal Thickness of Permanent Rolled Erosion Control Products
- ASTM D6567 Standard Test Method for Measuring the Light Penetration of a Turf Reinforcement Mat (TRM)
- ASTM D6818 Standard Test Method for Ultimate Tensile Properties of Turf Reinforcement Mats
- ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- ASTM D7322 Standard Test Method for Determination of Rolled Erosion Control Product (RECP) Ability to Encourage Seed Germination and Plant Growth Under Bench-Scale Conditions
- AWWA C206 Field Welding of Steel Water Pipe
- AWWA C207 Steel Pipe Flanges for Waterworks Service--Sizes 4 In. Through 144 In. (100 mm Through 3600 mm)
- AWWA C209 Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
- AWWA C210 Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

Design Criteria

Title:	Civil Design Criteria	
Project Doc. No.:	194043-000-DD10-DSC-001	Revision No.: 0

- AWWA C220 Stainless Steel Pipe, 1/2 In. (13 mm) and Larger
- AWWA C604 Installation of Steel Water Pipe - 4 In. (100 mm) and Larger
- AWWA C605 Underground Installation of PVC Pressure Pipe and Fittings for Water
- AWWA C800 Underground Service Line Valves and Fittings
- AWWA C900 PVC Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
- AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service
- AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1600 mm), for Water Distribution and Transmission
- AWWA C907 Injection-Molded PVC Pressure Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution

3 Site Demolition

The Site development plan requires demolition or relocation of some existing Site facilities to support construction of the proposed Site features. Facilities and piping to be demolished, abandoned or relocated include the following:

- Aeration Basin
- Flocculation Basin
- Sludge recycle piping
- Rapid Mix Tank
- Lime slurry feed piping
- Polishing Pond
- Polishing Pond Pump House
- Head House
- Bunker Creek Outfall
- Outfall House
- Acid Injection Basin

Temporary support and shoring will be provided for the existing maintenance building during demolition and backfilling of the Polishing Pond.

4 Site Layout

Access to the Site will be from an existing driveway access off of McKinley Avenue. The access road will enter the plant site from the northeast corner of the property.

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Title:	Civil Design Criteria	
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Driveways and the loop road shall have roadway geometry designed to accommodate commercial deliveries and future CTP expansion. The design vehicle accessing the site is a WB-40 articulated truck and trailer. This vehicle shall be able to access the following designated facilities without requiring extensive backing maneuvers:

- Lime Silos
- Filter Building
- Reactors
- Maintenance Building
- Backup Generators

Bollards, concrete barriers or guardrails will be provided to protect facilities from vehicles. Bollards shall be spaced on 4-foot centers at building or facility corners, and beside hydrants in traffic area.

New transformers will be located near the load center. The Backup Generators will be located beside the existing Generator. Adequate maneuvering accesses will be provided for refueling operations and for performing maintenance operations.

An Oil and Lubricant (POL) Containment Pad will be constructed at the eastside of the existing Maintenance Building.

5 Fencing

All fencing and manual gates shall be galvanized, minimum 6 feet tall. A vertical barbed wire arm shall be installed on each post with the ability to add barbed wire arms on top of the fencing in the future. A 4-foot mangate will be provided at every vehicle gate. Any fencing around the existing CTP that does not meet the requirements will be removed and replaced with the new fencing.

Design Criteria

Title:	Civil Design Criteria	
Project Doc. No.:	194043-000-DD10-DSC-001	Revision No.: 0

6 Site Grading

The 100-year flood elevation at the site is 2,280 feet. New facilities shall be designed to prevent inundation with finished floor elevations set at 2,282 feet minimum.

Site surfacing for the access road, parking and facility areas shall consist of gravel surfacing.

A cross slope will be maintained for site drainage purposes:

- Minimum 1%, maximum 4%
- Preferred 2% ~ 3%

Areas immediately adjacent to buildings shall be sloped a minimum of 3 - 4% over a distance of 7' to promote draining water away from the structures.

Overhead roll-up door ramps and pedestrian pathways shall have a maximum slope of 6% wherever practical, with an absolute maximum of 10%.

7 Stormwater Management

Stormwater runoff from yard area will be discharged directly to Bunker Creek, without being detained or treated. Stormwater from Lube Oil Pad will run through an oil water separator before discharge.

Management of stormwater must be integrated into other project aspects to meet the sustainability goals of the installation as a whole. Stormwater systems will be designed to maintain the hydrologic functions of the site.

Stormwater facilities will be sized to accommodate stormwater runoff from all site development surfaces and all runoff from buildings in conformance with the latest adopted edition of the reference standards. Designs must meet all of the requirements below:

- The designs must comply with Section 438 of the Energy Independence and Security Act (EISA), with the City of Kellogg City Code Title 13: Flood Control, and with IDEQ regulations.
- Fence all standing water facilities with side slopes steeper than 3H:1V for safety.
- Storm drain lines and branches within the site shall be polyvinyl chloride (PVC) plastic, ductile-iron, CPEP, or HDPE pipe.

For the ease of maintenance, buried stormwater pipe shall be minimized where practical. Stormwater lines shall truncate at a logical point near the new buildings but no closer than 5 feet to the buildings footprints. Connect building and roof drain where necessary. Stormwater will run into nearby ditch, and discharge into Bunker Creek through culverts.

Culvert design and stormwater conveyance shall conform to the requirements of the current version of the FHWA Hydraulic Design Manual.

Ditches will be designed for erosion control and ice flow conditions. The following criteria will apply:

- Minimum slope: 0.2%
- Minimum ditch depth: 12"
- Minimum ditch bottom width: 24"

Design Criteria

Title:	Civil Design Criteria	
Project Doc. No.:	194043-000-DD10-DSC-001	Revision No.: 0

Where applicable, culvert design will take into account thaw / freeze cycles that may create hazardous flooding condition. Culverts will be sized as follows:

- 1: 25 year storm: Water surface in ditch shall not be 12" higher than top of culvert
- Minimum diameter of new culverts: 12", preferably 18" for easy access for maintenance and thaw / freeze condition
- Minimum longitudinal slope: 0.5%
- Minimum velocity in pipe: 2.6 ft/s
- Culvert material: HDPE (High Density Polyethylene) dual wall pipe

Minimum culvert cover:

- Under road and traffic areas: 24"
- No-traffic areas: 12"

8 Flood Management

Existing facilities to remain (following facility upgrade) with finished floor elevations (FFE) below the 100-year flood elevation of 2,280 feet shall be mitigated to prevent flooding and damage to equipment and maintain operability of the CTP.

Permanent flood walls to an elevation of 2,282 feet will be constructed in areas that will not impede plant operations. Flood walls shall be constructed around the east, south and west sides of the lime silos. Access to the silos would be maintained from the north side. Sandbag will be stored at a designated area beside the silos for installation of a sandbag embankment at the north side of silos during a flood event. The volume of sandbag storage shall be at least 120% of the requirement for building a temporarily sand berm with 6 inches minimum freeboard.

9 Yard Piping

9.1 Existing Pipes

During construction, Mine Water Direct Feed Branch, Lined Pond Influent Line, Lime Slurry Feed Loops and Sludge Recycle line will be connected to the Temporary Treatment Plant.

At the end of construction, the above process pipelines will be permanently reconnected to new facilities.

Operation of Old Mine Water Line will be maintained through construction.

The frost depth at the site is 24 inches and all utilities shall have a minimum of 36 inches of cover. Where locally lowering the pipe is not economical or practical to obtain enough cover, the existing ground should be locally regraded to provide a minimum of 36 inches of cover.

9.2 New Process Pipes

New major process pipelines will be added on Site include the following:

Design Criteria

Title:	Civil Design Criteria	
Project Doc. No.:	194043-000-DD10-DSC-001	Revision No.: 0

- CIA GWCS influent pipeline
- CTP effluent pipeline
- Filter feed pipeline
- Sludge Filtrate return pipeline

New pipelines on site shall be routed in common corridors, where feasible. The corridor to the effluent discharge outfall will be at the west side of the northeast perimeter fence.

The pipe type, size and wall thickness will be sized and provided to civil discipline by process and piping disciplines.

9.3 Fire Protection Water Service

The CTP site shall be isolated from the distribution system via a backflow assembly located adjacent to the Main Gate.

Fire suppression flow for the CTP site shall be provided by a fire loop within the proposed CTP site with distribution mains, valving, and hydrant spacing per City of Kellogg City Code Title 7: Fire Regulations.

9.4 Potable Water Service

Potable water will be provided for the Filter Building by Piping discipline from the pump house through the pipe rack.

9.5 Sanitary Sewer

No new sanitary sewer lines are required on site.

END OF DOCUMENT

APPENDIX E

Design and Code Checklists

CIVIL SITE DESIGN

Bunker Hill Mine

Kellogg, Idaho

Not Req'd	Complete	Item to Check	Remarks
Civil Engineering			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify design meets RFP requirements	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify topographic information	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify project limits and clearing	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify temporary utilities.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify other disciplines and sheets for interferences and conflicts & coordination	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify existing and proposed grading plans	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify staging and temporary operations	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify wetland impacts (if required)	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	• Verify hazardous material impacts (if required)	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	• Verify threatened and endangered species impacts (if required)	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify site preparation	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify demolition	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify access road layout and grading (min 2%)	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Review to make sure grading does not allow ponding	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Access roads dimensions	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Staging areas on existing paved or cleared areas	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Confirm bedding & backfill materials	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Stormwater	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Basis of design	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Erosion Control Design	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	• Benchmark shown	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Outline specifications	

Completed by:  _____

Date Completed: May 17, 2018

SITE UTILITY
Bunker Hill Mine
Kellogg, Idaho

Not Req'd	Complete	Item to Check	Remarks
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify design meets RFP requirements	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Previous project review comments	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify topographic information	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify temporary utilities	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify project limits and clearing	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify other disciplines and sheets for interferences and conflicts & coordination	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify proposed grading plans. Coordination with utilities	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify staging and temporary operations	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Verify site preparation	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Review utility profiles to verify no utility conflicts and proper pitch	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Review trench details for proper bedding and compaction	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Confirm bedding & backfill materials	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	• Erosion Control Design	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	• Benchmark shown	

Completed by: 

Date Completed: May 17, 2018

APPENDIX F

Decommissioning and Salvage Plan

Bunker Hill Central Treatment Plant Upgrade and Groundwater Collection System

Demolition Decommissioning and Salvage Plan

Prepared for

Amec Foster Wheeler Environment & Infrastructure Services
751 Arbor Way, Suite 180
Blue Bell, PA 19422-1960

Prepared by

GeoTek, Inc.
7950 Meadowlark Way, Suite E
Coeur d'Alene, Idaho 83815



January 2018
Revised May 2018

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ACRONYMS, SYMBOLS, AND ABBREVIATIONS

Amec Foster Wheeler: Amec Foster Wheeler Amec Foster Wheeler Environment & Infrastructure, Inc.

API: American Petroleum Institute

CIA: Central Impoundment Area cm/s:
centimeters per second

cy: cubic yard

EDR: Engineering Design Report

EPA: U.S. Environmental Protection Agency
GWCS: Groundwater Collection System
HDPE: high-density polyethylene
Hp: horsepower
H:V: horizontal to vertical
I-90: Interstate 90
ITD: Idaho Transportation Department mg/kg:
milligrams per kilogram
NAD83: North American Datum of 1983 NAVD88:
North American Vertical Datum of 1988
oz/sy: ounce per square yard POC:
Proof of Concept
PTM: principal threat material
RFP: Request for Proposals
ROW: right-of-way
SBCW: Soil Bentonite Cutoff Wall
Sewer District: South Fork Coeur d'Alene River Sewer District
Sf: square feet
SIA: Sludge Impoundment Area
SPA: Slag Pile Area STA. Station
TESC: Temporary Erosion and Sediment Control
USACE: U.S. Army Corps of Engineers, Seattle District
Water District: Central Shoshone County Water District
XRF: X-ray fluorescence

1.0 PURPOSE

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) has been contracted by the U.S. Army Corp of Engineers (USACE), Seattle District, to perform design and construction for upgrades and expansion of the existing Central Treatment Plant (CTP); design and construction for a Groundwater Collection System (GWCS), including a Slurry/Bentonite Cutoff Wall and new Sludge Impoundment Area; operation and maintenance (O&M) of the existing treatment system; and commissioning and post-construction O&M of the expanded CTP and GWCS. Amec Foster Wheeler will conduct this work under Contract Number W912DW16-C-0012.

The purpose of this Demolition Decommissioning and Salvage Plan (DDSP) is to provide guidance in accordance with Specification Section 01 74 19 Construction and Demolition Waste Management for the personnel associated with this project for Central Treatment Plant (CTP) upgrades in 2018 and 2019. Demolition includes equipment, tanks, in-ground tanks, buildings, electrical systems, pipelines, fencing, communications, utility lines and connections, as required to meet the project requirements.

The Demolition Subcontractor will prepare a Demolition Plan consistent with Specification 02 41 00.04 to detail their salvage, demolition, and removal/disposal procedures as a stand alone plan. This plan will contain the subcontractor's approach to the specification requirements, ACM/LBP/hazards monitoring, sampling, and corrective actions.

2.0 DEMOLITION ACTIVITIES

The CTP upgrade plan is presented in Design Package 3 and requires demolition or relocation of some existing site facilities. Facilities and piping to be demolished (or relocated) include the following:

- Rapid Mix Tank
- Aeration Basin
- Flocculation Tank
- Polishing Pond
- Generator (relocation)
- Sludge recycle piping
- Lime slurry feed piping
- Head House

- Polishing Pond Pump House
- Aeration Basin Stairs
- Bunker Creek Outfall
- Acid Injection Basin

Figure 1 presents the CTP Demolition Plan. This plan describes the structures to be demolished and the demolition detail and key sequences. In summary, process structures to be decommissioned and demolished will be emptied and cleaned. Sludge will be pumped or otherwise transported to the Central Impoundment Area (CIA) sludge pond for disposal. Untreated liquids will be added to the headworks. Decommissioning and demolition will begin after the temporary treatment system is operational and the plant influent flows have been transferred.

2.1 Environmental Monitoring

Environmental, fugitive dust, and air emissions monitoring requirements and procedures are outlined in the Environmental Protection Plan, Stormwater Pollution Prevention Plan, Air Monitoring Plan, and Subcontractor's Demolition Plan

2.2 Notification

A *U.S. EPA Notification of Demolition and Renovation* form will be submitted at least 10 working days prior to CTP demolition commencement. The EPA Region 10 contact is John Pavitt (907271-3688) or Roylene Cunningham (206-553-0513). The website for downloading the notice is: <https://archive.epa.gov/region02/capp/web/pdf/asbestosnotificationformff.pdf>.

3.0 DEMOLITION WASTE

Management of demolition waste will occur during facility demolition activities to reasonably identify demolition and salvage materials prior demolition and the associated waste categories. These waste materials will be prepared for the appropriate waste category, staged according to construction sequence and site management, and properly disposed or repurposed.

Demolition waste will be managed in accordance with the project waste management plans including:

- Environmental Protection Plan (EPP)
- Waste Management Plan (WMP)
- Page Repository Disposal Plan (PRDP)
- Subcontractor's Demolition Plan

These plans provide the specific direction for waste categorization, reuse, recycling, disposal, preparation, and record keeping. The Demolition Decommissioning and Salvage Plan is a subset

of these plans and is consistent with project waste management Project Specifications including 01 10 00 Subparts 2.11 Demolition and Decommissioning, 3.13 Environmental, 5.5.1 Site Demolition; and, 01 74 19 Construction and Demolition Waste Management.

In summary, demolition waste, excess soils, packaging materials, and similar materials will be evaluated for various waste categories and relocated daily from the demolition area to the appropriate staging area.

Structural concrete and pavement demolition will be disposed of at the Page Repository. Metal siding, dimension lumber, the above-grade portions of billboards, railings, catwalks, and other above-grade demolition will be cleaned prior to demolition to remove contaminants and recycled or disposed of at permitted commercial noncontaminated material sites. Tanks, pumps, and piping will be cleaned and recycled and disposed in permitted commercial sites to the maximum extent practical. Small diameter piping, valves, and other demolition material that is difficult to clean may be cut into small pieces meeting the Page Repository disposal criteria. Coordinate disposal planning with IDEQ. Waste slurry shall be disposed of at the existing sludge pond on the CIA.

3.1 Waste Categories

Demolition waste will be managed within three major categories, as discussed in the WMP. These categories are as follows:

- Reuse
- Recycle
- Disposal

Project waste quantities have been preliminarily estimated in the WMP, Table A-2 Anticipated Waste Materials and Quantities. These quantities are focused on the CTP demolition wastes except for Waste rock, tailings, contaminated soils, Used Oil, and Solvents. The CTP contribution to the waste rock, tailings, and contaminated soils quantity is estimated at 5,000 cy. Used oil and solvents are focused on construction equipment operations and maintenance.

Table 1. Anticipated Waste Materials and Quantities (WMP Table A-2)

Anticipated Waste Material	Anticipated Quantity
Land Clearing Debris	5 tons
Asphalt	0.1 tons
Concrete	50 tons

Wood (treated and untreated)	5 tons
Metals (ferrous and non-ferrous)	25 tons
Glass	0.1 tons
Paper Products	1 ton
Plastic	0.25 tons
Gypsum	2 tons
Paint	0.1 tons
Carpet	0.25 tons
Ceiling Tiles	0.25 tons
Insulation	0.5 tons
Beverage Containers	0.25 tons
Solvents	25 gallons
Used Oils	1,000 gallons
Hazardous Waste	Unknown
Waste rock, tailings, contaminated soils	25,600 to 36,000 cy

As part of demolition, Amec Foster Wheeler will remove accumulated CTP sludge and dispose of it in the Sludge Pond atop the CIA. These volumes are currently estimated at: 1) Aeration Basin - 1,400 cubic yards, 2) Flocculation Tank - 500 cubic yards, 3) Polishing Pond - 8,800 cubic yards.

Relocate daily construction debris, waste materials, packaging material and similar material to controlled staging areas or disposal sites. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Salvageable materials resulting from demolition activities will be stored within a controlled area described above or at the supplemental storage area. Staged materials will be not stored on trailers.

3.1.1 Reuse Material

Reuse materials are materials identified for repurposing on-site. This may include items such as equipment, frames, and tanks. Prior to materials being designated for reuse, the Contracting Officer will be notified and authorize the material reuse. Reuse material will be cleaned and stored on-site at an agreed upon location with the Contract Officer.

3.1.2 Recycle Material

Recycle materials will follow the direction within the WMP. Recyclable materials, such as metals, will be extracted, cleaned, and sized for staging and transport. Recyclable material preparation will occur on-site consistent with construction operations. The SPA has been designated as a temporary staging area for large recyclable materials. Small quantity recyclables will be directed to the Shoshone County Transfer Station. Appropriate containers and transports will be on-site or provided by subcontractors hauling and/or receiving the recyclable materials.

3.1.3 Disposal

Disposal material are those materials that are not reused or recycled. The primary on-site disposal facility is Page Repository. Sludge will be disposed of at the CIA sludge pond. Demolition wastes must meet the Page Repository waste criteria of Project Specification 01 10 00 Subpart 3.13.1.2 Page Repository Disposal Requirements and be consistent with the Page Repository Disposal Plan.

Satisfactory Materials for Page Repository disposal are cobbles, boulders, aggregates, broken concrete, and any materials classified by ASTM D2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, or GM-GC that also meet the gradations provided in this section. The maximum nominal diameter shall be 4 feet. Materials shall be sound, durable, and be capable of being manipulated with excavators, bulldozers, or rock tongs without crumbling. Satisfactory materials shall be categorized as Starter Berms, Mattress, or General Waste. These wastes cannot be a Principal Threat Material (PTM).

PTM are those materials meeting or exceeding the project specification standards of 01 10 00 Subpart 3.13.1 Waste Procedure. Testing will be conducted as described in the WMP and Sample and Analysis Plan (SAP). If materials are determined to be PTM, they will be set aside, temporarily contained, and subject to the protocol described in the WMP and SAP for final offsite disposal.

3.1.4 Hazardous waste

Hazardous waste identification, handling, and disposal is discussed in the WMP and SAP. Amec Foster Wheeler will identify, characterize, remove, contain, and properly dispose of hazardous materials including but not limited to the following: asbestos containing materials, lead-based paint, PCB transformers and ballast, chemicals and other products in containers.

A hazards assessment was conducted in December 2017 (GeoTek) to evaluate the presence of hazardous materials within the CTP structures scheduled for demolition. Hazards such as mercury lights, transformers, and unknown liquid containers were not identified through visual inspection. Samples were taken on structures to determine the presence of asbestos and lead-based paint.

Samples were negative for asbestos. Pipeline seals and gaskets were identified as a potential asbestos source that was not sampled due to operational constraints. These elements will be considered asbestos containing material during demolition until sampling demonstrates otherwise. As such, asbestos PPE will be utilized when seals and gaskets are contacted. Samples will be laboratory tested. These materials will be placed in plastic bags, labeled, and temporarily stored in 55-gallon drums consistent with the Waste Management Plan and Subcontractor's Demolition Plan. Drums shall be marked as containing ACM. Once laboratory test results are known, the appropriate disposal facility will be selected. The Site Safety and Health Plan Officer or his representative will oversee waste labeling to ensure protective measures are in place in conformance with the Site Safety and Health Plan and Accident Prevention Plan.

The Subcontractor's asbestos trained supervisor will be on-site and overseeing the asbestos characterization, monitoring, controls, PPE, abatement, storage, and disposal per their Disposal Plan. This plan will be consistent with Specification 02 41 00.01 and address asbestos, lead-based paint, and other hazards as part of the subcontractor's procedures for demolition, decommissioning, and salvage.

Samples were negative for lead-based paint. Paint containing lead below 0.5% by weight was identified at the flocculation Basin and Outfall House. Workers will be notified and given proper Personal Protective Equipment to remove features identified with paint containing low levels of lead. The reports are found in Appendix A.

Two buildings require additional asbestos and lead-based paint assessment due to inaccessibility to the inside walls and ceilings: 1) Polishing Pond Pump House, and 2) Outfall House. These two buildings will be targeted by the Demolition Subcontractor for asbestos and lead-based paint assessment. All demolition will be subject to the Demolition Subcontractor's Demolition Plan consistent with Specification 02 41 00.04 to details their salvage, demolition, and removal procedures as a stand alone plan. This plan will contain the subcontractor's ways and means as it relates to the specification requirements, environmental, PPE assignment, monitoring, disposal, and other pertinent requirements. ACM and LBP assessment during construction, monitoring, removal/abatement, handling/storage, and disposal will be presented.

Any demolition debris not targeted for recycling and directed for off-site disposal will have a composite TCLP sample consistent with the Waste Management Plan, Section 3.2.4 Solid Waste

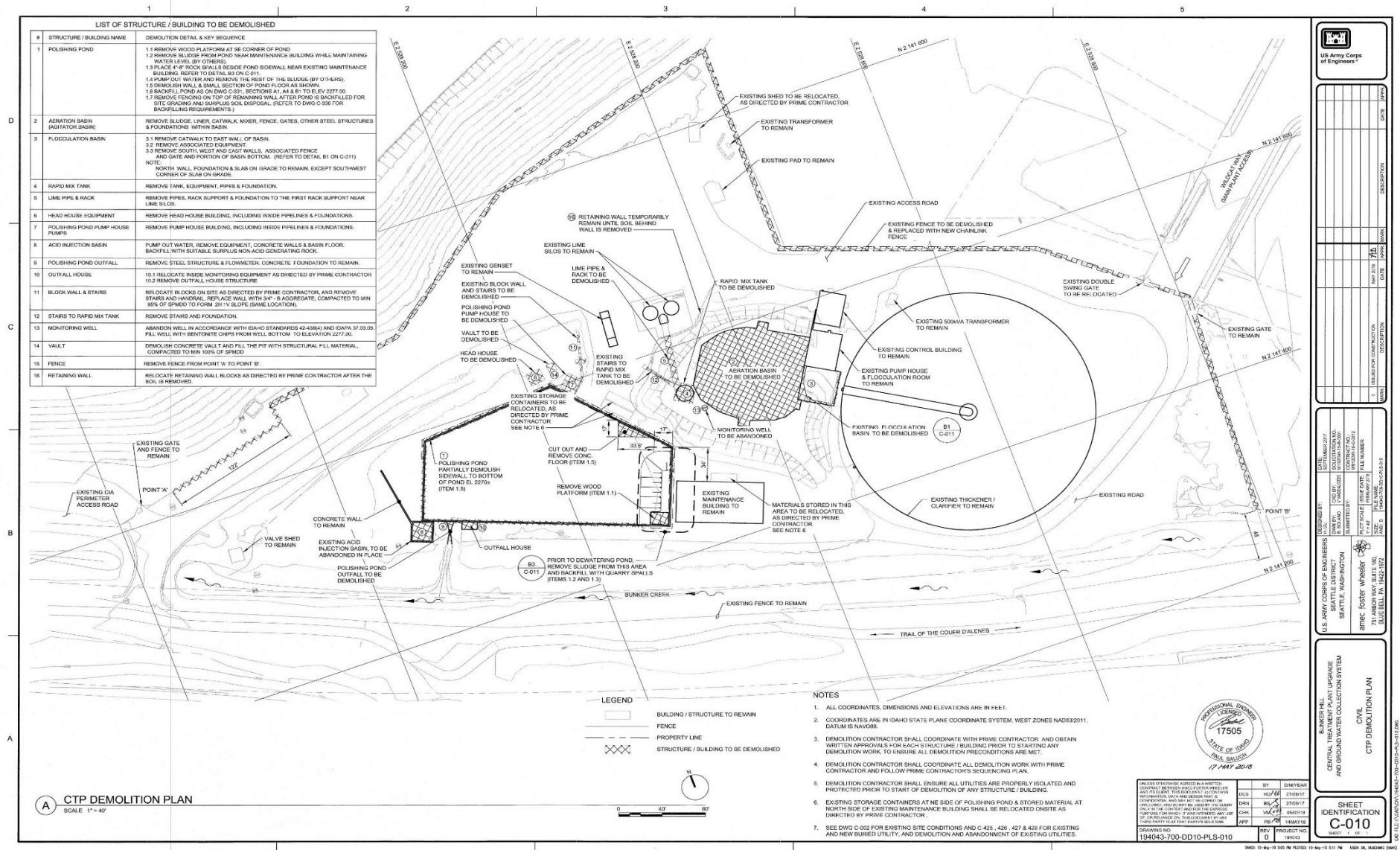
Disposal and Section 3.3.2 Designation, Sampling, and Analysis. The TCLP procedure will follow EPA Method 1311 Toxicity Characteristics Leaching Procedure. Sampling will be conducted by the Site Safety and Health Officer. TCLP results will be determined for the demolition debris and presented to the Contracting Officer. Debris that is determined to be hazardous material, including lead-based paint, will be managed and disposed off-site in accordance with the Waste Management Plan, Section 3.3 Control and Disposal of Hazardous Wastes. Debris determined to be solid waste will be managed and disposed off-site in accordance with the Waste Management, Section 3.2.4 Solid Waste Disposal.

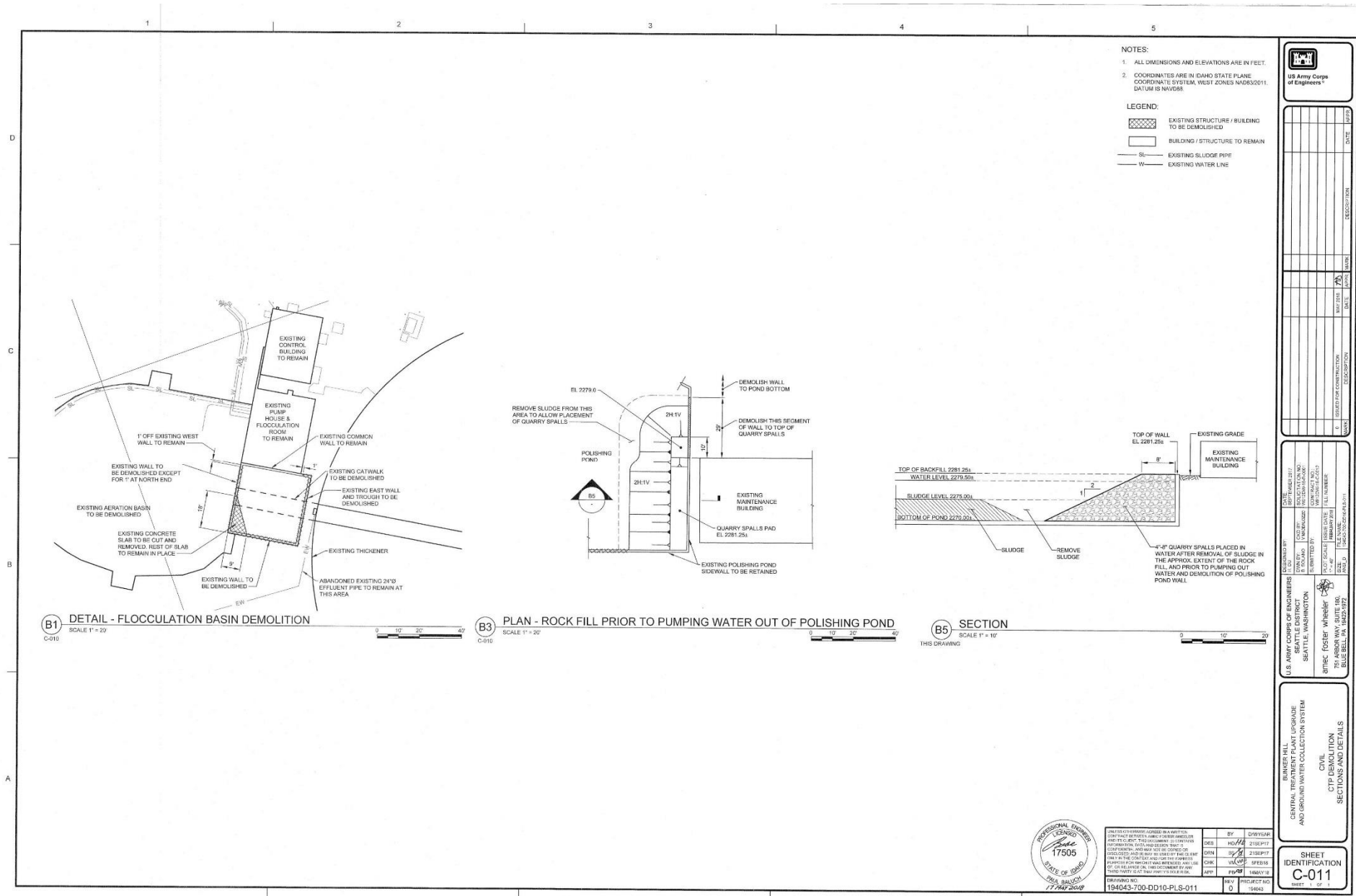
4.0 REPORTS

Quarterly Construction and Demolition Diversion/Disposal Transaction Reports and a final report will be produced to document the demolition waste and salvage generated and provided to the Contracting Officer. Each report will include supporting documentation to include manifests, weight tickets, receipts, and invoices specifically identifying the project and waste material. The C&D Diversion/Disposal Transaction Report form is found in the Appendix B.

FIGURES

Figure 1. Central Treatment Plan Demolition Plan





U.S. ARMY CORPS OF ENGINEERS
WATERWAYS DIVISION
SEATTLE, WASHINGTON

PROJECT: 194043-700-DD10-PL-011
SHEET: C-011

DATE: 10/15/2010
BY: J. W. WHEELER
CHECKED: J. W. WHEELER
APPROVED: J. W. WHEELER

REVISIONS:

NO.	DATE	DESCRIPTION
1	10/15/2010	ISSUED FOR CONSTRUCTION

PROJECT: 194043-700-DD10-PL-011
SHEET: C-011



DESIGNED BY	J. W. WHEELER	DATE	10/15/2010
CHECKED BY	J. W. WHEELER	DATE	10/15/2010
APPROVED BY	J. W. WHEELER	DATE	10/15/2010
PROJECT NO.	194043-700-DD10-PL-011		
SHEET NO.	C-011		

SHEET IDENTIFICATION
C-011
SHEET 1 OF 1

APPENDIX A

CTP Hazards Assessment Reports



GeoTek, Inc.
7950 N.Meadowlark Way Suite E Coeur d'Alene, ID 83815
(208) 904-2980 Office (208) 904-2981 Fax www.geotekusa.com

LEAD-BASED PAINT SURVEY
BUNKER HILL CENTRAL TREATMENT PLANT
KELLOGG, IDAHO

January 5, 2018

GEOtek Project No. 1484-ID2

Prepared For:

AMEC FOSTER WHEELER

GEOTECHNICAL | ENVIRONMENTAL | MATERIALS

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1.0 EXECUTIVE SUMMARY

GEOTEK, INC. (GEOTEK) has performed a Lead-Based Paint survey at The Bunker Hill Central Treatment Plant, located in the City of Kellogg, Shoshone County, Idaho (the "Site"). Our services were conducted in substantial conformance with the scope and limitations of the United States Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, 2012 Edition. Any additions or deletions from our scope of services are discussed in the appropriate sections of this assessment.

Based on our LBP survey, lead-based paint was not identified in or on the structures.

Lead-containing paint was identified. This necessitates hazardous communications protocols for workers conducting the demolition of the structures under U.S. Occupational Safety and Health (OSHA). An awareness of the location of the lead-containing paint and general information regarding hygiene (no eating, drinking, or smoking, and washing of hands after construction work) will be sufficient. Level D personal protective equipment should be provided.

This executive summary does not contain all the information that is found in the full report. The report should be read in its entirety to obtain a more complete understanding of the information provided, and to aid in any decisions made or actions taken based on this information.



2.0 INTRODUCTION

On December 19, 2017, GEOTEK, INC. (GEOTEK) conducted a lead-based paint (LBP) survey of at the Bunker Hill Central Treatment Plant in the City of Kellogg, Shoshone County, Idaho, hereinafter referred to as the "Site" (see Figure 1 in Appendix A).

2.1 PURPOSE

The purpose of the survey was to locate, sample, and assess the condition of accessible building materials within specific buildings that were suspected of containing lead-based paint. The survey was limited to specific building and structures identified in a provided Civil CTP Demolition Plan (included in Appendix A). The survey was performed by Mr. J. Michael Batten, a U.S. Environmental Protection Agency (EPA) Certified Inspector and Assessor.

2.2 THIRD PARTY RELIANCE

Third party reliance letters may be issued upon request and upon the payment of the, then current, fee for such letters. All third parties relying on GEOTEK's reports, by such reliance, agree to be bound by GEOTEK's General Conditions and limitations. No reliance by any party is permitted without such agreement, regardless of the content of the reliance letter itself.

3.0 DESCRIPTION OF FACILITY

The Site is occupied by the Bunker Hill Central Treatment Plant, located in the City of Kellogg, Shoshone County, Idaho. The survey was limited to specific building and structures identified in a provided Civil CTP Demolition Plan (included in Appendix A).

The Polishing Pond wall scheduled for demolition was of concrete construction with expansion joints. A fence painted gray surrounds the perimeter.

The Aeration Basin was an earthen structure with a metal catwalk and metal piping painted green.

The Flocculation Basin is a metal containment painted orange-tan, with a metal catwalk painted green, and a concrete structure painted gray.

The Rapid Mix Tank was a metal structure with metal piping all painted blue-green.

The Lime Pipe and Rack is a metal piping structure painted orange-tan.

The Head House is a concrete block building with a metal roof. It also contains metal piping painted light blue, gray, and yellow.

The Polishing Pond Pump House is a concrete building containing metal piping painted yellow.

The Acid Injection basin scheduled for demolition has metal piping painted green.

The Polishing Pond Outfall is a metal pipe and catwalk structure painted green.

The Outfall House is a wood and metal structure with metal piping. Paint on the structure are tan and gray.

The Block Wall & Stairs is scheduled to be dis-assembled, with the blocks remaining intact. The rail is painted yellow.

The Stairs to the Rapid Mix Tank are a metal structure painted green.

The Vault is a concrete structure.

4.0 FINDINGS

Painted surfaces were identified on the structures. LeadCheck™ chemical swabs were used on the painted surfaces (one or two on each surface) as a screening tool. Paint chip samples were obtained and analyzed for confirmation of lead content.

Fourteen (14) chemical swabs were utilized at the Site. The swab samples results are presented in Table I, below:

**TABLE I
LEADCHECK SWAB RESULTS**

COLOR	LOCATION	RESULTS
Gray	Polishing Pond fence	Negative
Green	Aeration basin pipes & catwalk	Negative
Green	Flocculation Basin pipes & catwalk	Negative
Orange-tan	Flocculation Basin reservoir	Negative
Gray	Flocculation Basin concrete	Positive
Blue-green	Rapid Mix tank & pipes	Negative
Orange-tan	Lime Pipe & Rack	Negative
Light blue	Head House pipes	Negative
Gray	Head House pipes	Negative
Yellow	Head House pipes and railing	Negative
Yellow	Polishing Pond Pump House railing	Negative
Green	Polishing Pond Outfall	Negative
Yellow	Block Wall railing	Negative
Tan	Outfall House	Positive
Gray	Outfall House	Positive

Paint chip samples were obtained from the Flocculation Basin concrete and the Outfall House. The paint samples were submitted to Environmental Management Consultants in Phoenix, Arizona, for analysis in accordance with U.S. Environmental Protection Agency (EPA) Methods L01/I and 7420. The analytical results are presented in Table II on the following page:

TABLE II
LABORATORY RESULTS SUMMARY

COLOR	LOCATION	RESULTS (% BY WEIGHT)
Gray	Flocculation Basin concrete	0.038%
Tan	Outfall House	0.445%
Gray	Outfall House	0.132%

BRL = Below Reporting Limit (reporting limit)

The samples did not contain lead at concentrations above 0.5% by weight. Lead-Based Paint is defined by EPA, HUD, and the U.S. Occupational Safety and Health Administration (OSHA), as paint containing 0.5% lead by weight. Lead-containing paint is paint containing a detectable level of lead, but does not require remediation.

Based on our LBP survey, lead-based paint was not identified in or on the structures. A copy of the laboratory report is included in Appendix B.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our LBP survey, lead-based paint was not identified in or on the structures at the Site.

Lead-containing paint was identified. This necessitates hazardous communications protocols for workers conducting the demolition of the structures under U.S. Occupational Safety and Health (OSHA). An awareness of the location of the lead-containing paint and general information regarding hygiene (no eating, drinking, or smoking, and washing of hands after construction work) will be sufficient. Level D personal protective equipment should be provided.

If additional materials not described in this report are discovered during demolition, or if the scope of renovations changes to impact other systems not surveyed as part of this LBP survey, they should be assumed to contain asbestos and/or lead-based paint until proven otherwise.

6.0 LIMITATIONS

6.1 SPECIAL TERMS AND CONDITIONS

GEOTEK conducted the LBP Survey in general accordance with HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, 2012 Edition, as authorized by AMEC FOSTER WHEELER. This study does not include sampling of soil, groundwater and/or the debris on-Site for environmental testing. This report is intended for the use of AMEC FOSTER WHEELER and their immediate assignees. The contents should not be relied upon by any party other than the aforementioned without the express written consent of GEOTEK. This survey alone is not to be used for abatement purposes.

6.2 LIMITATIONS AND EXCEPTIONS OF ASSESSMENT

The findings, conclusions, and recommendations made in this report are based on the information that was made available to GEOTEK, in most instances from public records. The information is relevant to the date of our site work and should not be relied on to represent conditions at any later date. The opinions and conclusions expressed herein are based on information obtained during our assessment and on our experience and current standards of technical practice. GEOTEK makes no other warranties, either express or implied, concerning the completeness of the data furnished to us. GEOTEK cannot be responsible for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed at the time our assessment was undertaken. GEOTEK is not responsible, nor liable for work, testing or recommendations performed or provided by others. This report is not and should not be construed as a warranty or guarantee about the presence or absence of additional environmental hazards or contaminants, which may affect the subject Site. Facts, conditions, and acceptable risk factors change with time; accordingly, this report should be viewed within this context.

7.0 CERTIFICATIONS

GEOTEK, INC. (GEOTEK) has performed a Lead-Based Paint Survey of the Bunker Hill Central Treatment Plant located in the City of Kellogg, Shoshone County, Idaho (the "Site").

The project team qualifications are included in Appendix C.

We appreciate this opportunity to be of service. If you have any questions, or if we can be of further service, please contact us at (702) 897-1424.

Sincerely,
GEOTEK, INC.

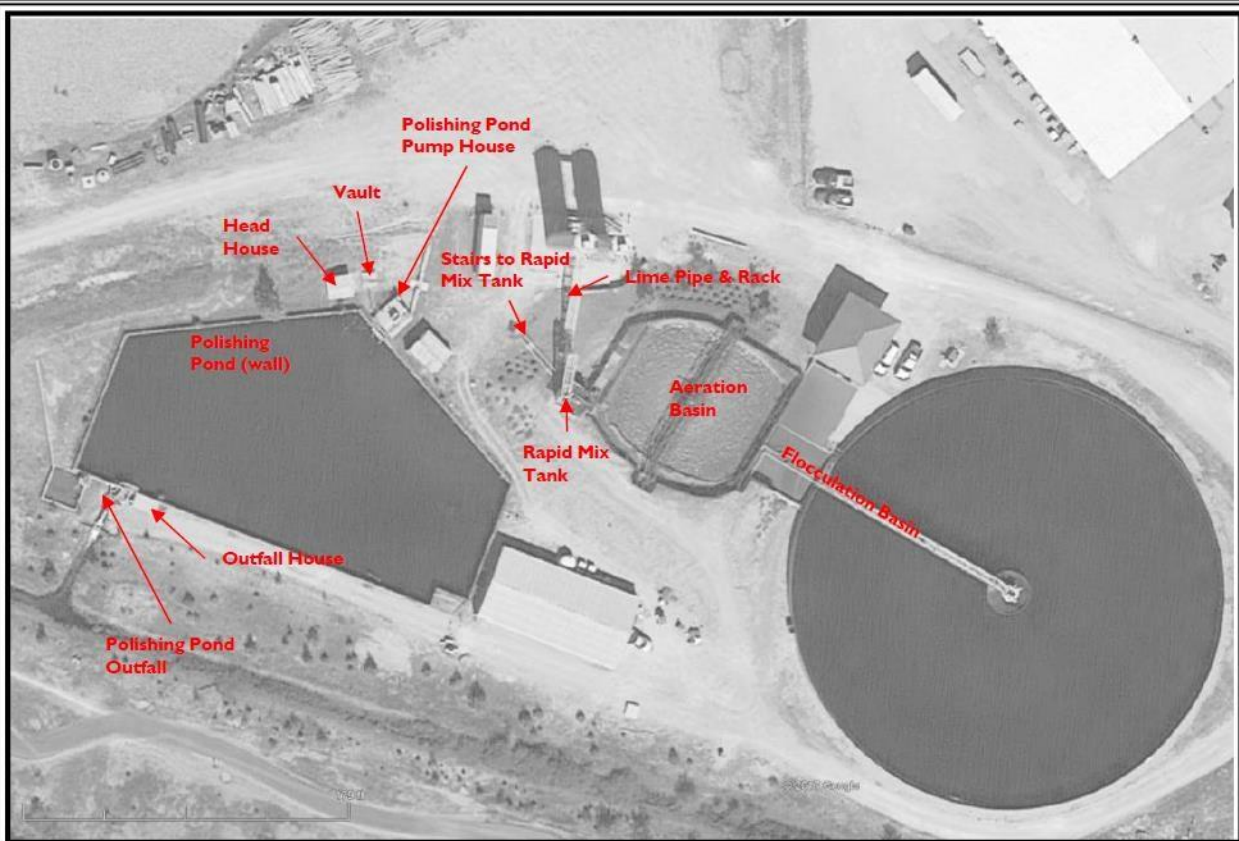


J. Michael Batten
Environmental Services Manager
EPA Certified Lead Inspector No. LBP-I-1162326-1 (expires 03/14/19)
EPA Certified Lead Risk Assessor No. LBP-R-1162326-1 (expires 03/14/19)

I484-ID2-LBP-Report-AMEC Foster Wheeler-Bunker Hill CTP-JMB-010218

APPENDIX A

FIGURES



Source: Google Earth, August 2014
Scale: Not given



GEOTECHNICAL | ENVIRONMENTAL | MATERIALS

7950 N. Meadowlark Way, Suite E, Coeur d'Alene, ID 83815
(208) 904-2980 (phone) / (208) 904-2981 (FAX)

FIGURE I SITE LAYOUT MAP

BUNKER HILL CENTRAL TREATMENT PLANT
KELLOGG, IDAHO
Prepared for: AMEC FOSTER WHEELER

Project No.:

1484-ID2-LBP

Report Date:

01/02/18

Drawn By:

JMB

AMEC FOSTER WHEELER
BUNKER HILL CENTRAL TREATMENT PLANT
GEOTEK PROJECT NO. 1484-ID2

JANUARY 2, 2018
APPENDIX B

APPENDIX B

LABORATORY REPORT





9830 South 51st Street, Suite B-109 / PHOENIX, ARIZONA 85044 / 480-940-5294 or 800-362-3373 / FAX 480-893-1726
emclab@emclabs.com

LEAD (Pb) IN PAINT CHIP SAMPLES
EMC SOP METHOD #L01/1 EPA SW-846 METHOD 7420


EMC LAB #:		L67532		DATE RECEIVED:		12/21/17	
CLIENT:		Geotek, Inc.		REPORT DATE:		12/28/17	
				DATE OF ANALYSIS:		12/22/17	
CLIENT ADDRESS:		6835 S. Escondido St, Ste A Las Vegas, NV 89119		P.O. NO.:			
PROJECT NAME:		Bunker Hill CTP		PROJECT NO.: 1484-ID2			
EMC # L67532-	SAMPLE DATE /17	CLIENT SAMPLE #	DESCRIPTION		REPORTING LIMIT (%Pb by weight)	%Pb BY WEIGHT	
1	12/19	1484-L1	Gray / Flocculation		0.010	0.038	
2	12/19	1484-L2	Tan / Outfall House		0.010	0.445	
3	12/19	1484-L3	Gray / Outfall House		0.013	0.132	

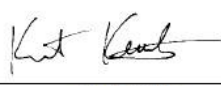
^A = Dilution Factor Changed * = Excessive Substrate May Bias Sample Results BRL = Below Reportable Limits # = Very Small Amount Of Sample Submitted, May Affect Result

This report applies to the standards or procedures identified and to the samples tested only. The test results are not necessarily indicative or representative of the qualities of the lot from which the sample was taken or of apparently identical or similar products, nor do they represent an ongoing quality assurance program unless so noted. Unless otherwise noted, all quality control analyses for the samples noted above were within acceptable limits.

Where it is noted that a sample with excessive substrate was submitted for laboratory analysis, such analysis may be biased. The lead content of such sample may, in actuality, be greater than reported. EMC makes no warranty, express or implied, as to the accuracy of the analysis of samples noted to have been submitted with excessive substrate. Resampling is recommended in such situations to verify original laboratory results.

These reports are for the exclusive use of the addressed client and are rendered upon the condition that they will not be reproduced wholly or in part for advertising or other purposes over our signature or in connection with our name without special written permission. Samples not destroyed in testing are retained a maximum of sixty (60) days.

ANALYST: 
Jason Thompson

QA COORDINATOR: 
Kurt Kettler

CHAIN OF CUSTODY

EMC Labs, Inc.
9830 S. 51st St., Ste B-109
Phoenix, AZ 85044
(800) 362-3373 Fax (480) 893-1726

LAB#: 267532
TAT: Lead 3 days
Rec'd: 12/21/17

COMPANY NAME: **GEOTEK, INC**

BILL TO: (If Different Location)

6835 S. Escondido St, Ste A

Las Vegas, NV 89119

CONTACT: J. Michael Batten

Phone/Fax: (702) 897-1424 / (702) 897-2213

Email: mbatten@geotekusa.com & jsmith@geotekusa.com

Now Accepting: **VISA - MASTERCARD**

Price Quoted: \$ ____ / Sample \$ ____ / Layers

COMPLETE ITEMS 1-4: (Failure to complete any items may cause a delay in processing or analyzing your samples)**1. TURNAROUND TIME:** [Same Day RUSH] [1-Day] [2-Day] [3-Day] [5-Day] [6-10 Day]

***Prior confirmation of turnaround time is required

***Additional charges for rush analysis (please call marketing department for pricing details)

***Laboratory analysis may be subject to delay if credit terms are not met

2. TYPE OF ANALYSIS: [Bulk-PLM] [Air-PCM] [Lead] [Point Count] [Fungi: AOC, W-C, Bulk, Swab, Tape]**3. DISPOSAL INSTRUCTIONS:** [Dispose of samples at EMC] / [Return samples to me at my expense]

(If you do not indicate preference, EMC will dispose of samples 30 days from analysis.)

4. Project Name: Bunker Hill CTP

P.O. Number: _____

Project Number: 1484-1D2

EMC SAMPLE #	CLIENT SAMPLE #	DATE & TIME SAMPLED	LOCATION/MATERIAL TYPE	Samples Accepted Yes / No	AIR SAMPLE INFO / COMMENTS		
					ON	OFF	FLOW RATE
1	1484-L1	12/19	Lead	9 N			
2	2			9 N			
3	3			6 N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			

SPECIAL INSTRUCTIONS: _____

Sample Collector: (Print) _____

(Signature) _____

Relinquished by: JDereDate/Time: 12/21/17Received by: [Signature]Date/Time: 12/21/17

Relinquished by: _____

Date/Time: _____

Received by: _____

Date/Time: _____

Relinquished by: _____

Date/Time: _____


Received by: _____

Date/Time: _____

** In the event of any dispute between the above parties for these services or otherwise, parties agree that jurisdiction and venue will be in Phoenix, Arizona and prevailing party will be entitled to attorney's fees and court costs.

LEAD-BASED PAINT SAMPLE LOG/CHAIN OF CUSTODY

Page 1 of 1

	GEOTEK, INC. 6835 South Escondido Street, Suite A Las Vegas, NV 89119 Phone: (702) 897-1424 FAX: (702) 897-2213	Project No.: 1484-ID2 Project Name: Bunker Hill CTP Project Manager: J. Michael Batten Sampled By: <i>[Signature]</i> Date: 12/19/17	LABORATORY INSTRUCTIONS Flame AA Standard T/A
---	--	--	--

Sample No.	Color	Location	Condition	Area (sf/lf)	Comments
1484-L1	Gray	Perkulation	D		
1484-L2	Dark Tan	Outfall House	D		
1484-L3	Gray	Outfall House	D		

CHAIN OF CUSTODY			
Relinquished by: <i>J. Michael Batten</i>	Company: GEOTEK, INC.	Date: 12/20/17	Time: 12:00
Received by: <i>D. Jorre</i>	EMC Lobs	12/21/17	
Relinquished by: <i>D. Jorre</i>	EMC Lobs	12/21/17	
Received by:			

GEOTECHNICAL | ENVIRONMENTAL | MATERIALS

APPENDIX C

PROJECT TEAM QUALIFICATIONS



J. MICHAEL BATTEN, CAC, CEM, REPA

Environmental Services Manager

Education

BS in Geology, (b) (6)
(b) (6)

Registrations

- Certified Asbestos Consultant
(b) (6)
- Licensed Asbestos Abatement Consultant (b) (6)
- Certified Environmental Manager
(b) (6)
- Asbestos Professional Inspector
(b) (6)
- Registered Environmental Property Assessor
(b) (6)
- Certified Lead Inspector Assessor
(b) (6)
- Certified Lead Inspector
(b) (6)
- Certified Lead Risk Assessor
(b) (6)

Certifications

- AHERA Certified Asbestos Building Inspector, Management Planner, Project Designer, & Contractor/Supervisor
- EPA Accredited Lead-based Paint Inspector & Risk Assessor
- OSHA HAZWOPER certified worker & supervisor
- OSHA Construction Safety & Health (10-Hour)

Affiliations

- American Society of Testing and Materials
- National Registry of Environmental Professionals

Professional Experience

Mr. Batten has over 26 years of environmental experience, throughout which he has conducted and managed numerous environmental investigations, assessments, and remediations. He has prepared several NEPA assessments, USEPA EIS, and CEQA EIR reports. In addition, Mr. Batten has extensive experience in conducting asbestos and lead-based paint surveys and preparing management plans, including remediation design, for asbestos and lead present in buildings.

Project Experience

- **Phase I Environmental Site Assessments:** Mr. Batten has conducted more than 2,000 Phase I Environmental Site Assessments in 21 states, including Brownfield studies under USEPA grants.
- **Phase II Environmental Site Assessments:** Mr. Batten has conducted more than 150 Phase II Environmental Assessments, including Brownfield studies under USEPA grants.
- **Site Characterizations and Remediations:** Mr. Batten has experience conducting numerous site characterizations and remediations, including obtaining regulatory closure.
- **NEPA Studies:** Mr. Batten has conducted more than 200 NEPA studies, including Environmental Assessments, Environmental Impact Reports/Environmental Impact Studies, in eight states. The agencies involved include USEPA, FCC, BLM, National Park Service, and California EPA.
- **Asbestos Services:** Mr. Batten has conducted over 600 asbestos surveys in several states. He has also prepared numerous Asbestos Management Plans, prepared design plans, and monitored numerous abatement projects.
- **Lead-Based Paint Services:** Mr. Batten has conducted numerous Lead-Based Paint surveys.
- **Landfills:** Mr. Batten has conducted investigations and overseen remediations on landfills in Fresno, California and Henderson, Nevada.
- **Other Services:** Mr. Batten has been called upon to conduct less usual services on occasion, including mold consultation and investigation, radon studies, vapor intrusion studies, and indoor air quality studies.

J. MICHAEL BATTEN, continued...



Professional History

Environmental Services Manager. GeoTek, Inc., 2001 to present.

Director of Environmental Services. ATC Associates, Inc., 1999 to 2001.

Director of Operations. Hygienetics Environmental Services, Inc., 1997 to 1999.

Project Manager. AllWest Environmental, Inc., 1996 to 1997.

Project Manager. Citadel Environmental Services, Inc., 2/1996 to 9/1996.

Project Manager. Boelter Environmental consultants, 3/1995 to 9/1995.

Senior Staff Geologist. Converse Consultants, 1992 to 1995.

Staff Geologist. Converse Environmental West, 1991 to 1992.

Project Geologist. Krazan and Associates, 1990 to 1991.

Environmental Technician. Krazan and Associates, 1989 to 1990.

National Registry of Environmental Professionals

For
Environmental Certifications

This is to Certify that

Michael J Batten

having successfully demonstrated to the Academic Board of this organization
the required level of knowledge and ability, is here by awarded the distinction of

Registered Environmental Property Assessor

together with all rights, benefits and privileges attached thereto and that the name and title of the
aforementioned registrant is today placed upon the register of the organization.

Given under our hands on this 15 day of June, 2013.


Executive Director



(b) (6)

Registrant Number

This Certificate is the property of the National Registry of Environmental Professionals and must, upon demand, be returned.

United States Environmental Protection Agency

This is to certify that

J. Michael Batten



has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 14, 2019

(b) (6)

Certification # _____

February 29, 2016 _____

Issued On _____



Adrienne Priselac, Manager, Toxics Office

Land Division



GeoTek, Inc.

7950 N.Meadowlark Way Suite E Coeur d'Alene, ID 83815

(208) 904-2980 Office (208) 904-2981 Fax www.geotekusa.com

**LIMITED ASBESTOS CONTAINING
MATERIALS SURVEY**

**BUNKER HILL CENTRAL TREATMENT PLANT
KELLOGG, IDAHO**

Revised March 7, 2018

GEOtek Project No. 1484-ID2

Prepared For:

AMEC FOSTER WHEELER

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APPENDIX C: PROJECT TEAM QUALIFICATIONS

I.0 EXECUTIVE SUMMARY

GEOTEK, INC. (GEOTEK) has performed a Limited Asbestos-Containing Materials Survey at the Bunker Hill Central Treatment Plant in the City of Kellogg, Shoshone County, Idaho (the "Site"). Our services were conducted in substantial conformance with the scope and limitations of the Asbestos Hazard Emergency Response Act (AHERA), codified in Title 40 of the Code of Federal Regulations, Part 763 (40 CFR 763). Any additions or deletions from our scope of services are discussed in the appropriate sections of this assessment.

Based on the analytical results of the ACM survey, asbestos-containing materials were not identified in the structures at the Site. However, operations at the plant on the date of our survey made it impossible to obtain samples of the multiple seals and gaskets in the pipelines at the Site. These materials should be considered ACM until operations permit the testing of them.

This executive summary does not contain all the information that is found in the full report. The report should be read in its entirety to obtain a more complete understanding of the information provided, and to aid in any decisions made or actions taken based on this information.

2.0 INTRODUCTION

On December 19, 2017, GEOTEK, INC. (GEOTEK) conducted a limited asbestos-containing materials (ACM) survey at the Bunker Hill Central Treatment Plant in the City of Kellogg, Shoshone County, Idaho, hereinafter referred to as the "Site" (see Figure 1 in Appendix A). Additional samples were obtained on January 18, 2018.

2.1 PURPOSE

The purpose of the survey was to locate, sample, and assess the condition of accessible building materials, within specific buildings and structures, that were suspected of containing asbestos. The survey was limited to specific building and structures identified in a provided Civil CTP Demolition Plan (included in Appendix A). The survey was performed by Mr. J. Michael Batten, a U.S. Environmental Protection Agency (EPA) Accredited Building Inspector.

2.2 THIRD PARTY RELIANCE

Third party reliance letters may be issued upon request and upon the payment of the, then current, fee for such letters. All third parties relying on GEOTEK's reports, by such reliance, agree to be bound by GEOTEK's General Conditions and limitations. No reliance by any party is permitted without such agreement, regardless of the content of the reliance letter itself.

3.0 ASBESTOS SAMPLING AND ANALYTICAL METHODS

The survey area of the Site was inspected for the presence of material that was suspected of containing more than one percent asbestos. ACMs were divided into three main categories: Surfacing Materials, Thermal System Insulation, and Miscellaneous Materials. Suspect materials identified were described and categorized into homogeneous areas. A homogeneous area consists of identified material found in various locations in a building that is identical in color, appearance, pattern, texture, and date of installation.

The asbestos sampling was conducted in substantial accordance with Asbestos Hazard Emergency Response Act (AHERA) guidelines. For this survey, the number of samples collected was limited to up to three samples per homogeneous area, unless large quantities of insulation or surfacing material were encountered. Other limitations and exclusions are discussed in Sections 5.4 and 7.0.

3.1 SAMPLING PROTOCOL

Samples of suspect materials were collected in a distributed manner. No samples were collected from any homogeneous area where the inspector determined that the material was non-ACM (such as thermal system insulation that was obviously fibrous glass, foam glass, or rubber).

Samples were obtained with tools designed to penetrate a material without creating excessive dust. A utility knife, chisel, and hammer were utilized, rather than scratching a sample from the surface of suspected materials, in an effort to obtain a sample that was representative of all layers of the material. The area was pre-wetted to reduce fiber generation during the sampling process.

GEOTEK sampling procedures incorporate the use of containers labeled in a unique numbering sequence to store the bulk samples. Information about bulk samples, including the sample number and material description, were recorded on the Chain-of-Custody forms as each sample was collected. Analytical results and Chain-of-Custody forms are included in Appendix B.

3.2 ANALYTICAL PROTOCOL

Sixteen (16) bulk samples of suspect building materials were collected from the study area at the Site. Bulk samples were submitted to Environmental Management Consultants in Phoenix, Arizona, for analysis in accordance with U.S. Environmental Protection Agency (EPA) Method 600/R-93/116, Polarized Light Microscopy (PLM). The laboratory is accredited for PLM analysis by the National Voluntary Laboratory Accreditation Program (NVLAP), accreditation No. 1926. PLM analysis requires the microscopist to take a portion of the sample and treat it with an oil of specific refractive index. The prepared slide is then subjected to a variety of tests while being viewed under varying polarizations of light. Each type of asbestos displays unique characteristics when subjected to these tests. Percentages of the identified types of asbestos are determined by visual estimation.

4.0 DESCRIPTION OF FACILITY

The Site is occupied by Bunker Hill Central Treatment Plant, located in the City of Kellogg, Shoshone County, Idaho. The survey was limited to specific building and structures identified in a provided Civil CTP Demolition Plan (included in Appendix A).

The Polishing Pond wall scheduled for demolition was of concrete construction with expansion joints.

The Aeration Basin was an earthen structure with a metal catwalk and metal piping.

The Flocculation Basin is a metal containment with a metal catwalk and a concrete structure with pumps and metal piping.

The Rapid Mix Tank was a metal structure with metal piping.

The Lime Pipe and Rack is a metal piping structure.

The Head House is a concrete block building with a metal roof. It also contains metal piping.

The Polishing Pond Pump House is a concrete building with an asphaltic roof. It also contains metal piping.

The Acid Injection basin is a concrete basin with metal piping.

The Polishing Pond Outfall is a metal pipe and catwalk structure.

The Outfall House is a wood and metal structure with metal piping.

The Block Wall & Stairs is scheduled to be dis-assembled, with the blocks remaining intact. Therefore, the blocks were not sampled for this survey.

The Stairs to the Rapid Mix Tank are a metal structure (no suspect ACM).

The Vault is a concrete structure with metal piping.

5.0 FINDINGS

Based on the analytical results of the limited ACM survey, asbestos-containing materials were not identified in the structures on the Site. A figure identifying the structures is included in Appendix A. The laboratory reports are included in Appendix B.

According to the U.S. Occupational Safety and Health Administration (OSHA) and EPA regulations, any material that contains greater than one percent ($>1\%$) of any type of asbestos is considered an ACM. The following narrative lists the types of suspect materials sampled during the survey. Similar materials with unique patterns or colors (such as ceiling tiles, floor tiles, etc.) have been assigned unique homogeneous areas.

5.1 REGULATED ASBESTOS-CONTAINING MATERIALS (RACM)

Ceiling Panels

Ceiling panels were not identified in the structures on the Site.

Skim Coat/Wall Texture

Wall texture was not identified on the structures at the Site.

Spray-Applied Acoustic Ceiling Material (SAAC)

SAAC was not identified on the ceilings of the structures at the Site.

Thermal System Insulation

Thermal insulation, where identified, was determined to be fiberglass. Insulation was identified in the Head House and the Polishing Pond Pump House.

Wall Plaster

Wall plaster was not identified in the structures at the Site.

5.2 CATEGORY I NON-FRIABLE MATERIALS

Gaskets/Seals

Metal piping with numerous gaskets were observed at the Aeration Basin, Flocculation Basin, Lime Pipe & Rack, Head House, Polishing Pond Pump House, Acid Injection Basin, Polishing Pond Outfall, Outfall House, and Vault. Operations at the plant on the date of our survey made it impossible to obtain samples of the multiple seals and gaskets in the pipelines at the Site. These materials should be considered ACM until operations permit the testing of them.

Roofing Systems

The roofing system of the Polishing Pond Pump House was identified as asphalt shingles. Two (2) samples of this material were obtained. Asbestos was not detected in the samples analyzed.

Roof systems of the Head House and the Outfall House were identified as metal. The remaining structures did not have roofing systems.

Vinyl Floor Tile and Floor Mastic

Vinyl floor tile (VFT) and mastic were not identified in the structures on the Site.

Vinyl Sheet Flooring and Mastic

Vinyl Sheet Flooring and associated mastics were not identified in the structures on the Site.

5.3 CATEGORY II NON-FRIABLE MATERIALS

Asbestos Cement

Asbestos cement products were not observed in the structures on the Site.

Concrete

Concrete was identified as the primary component of the Polishing Pond wall. Two (2) samples of this material were obtained. Asbestos was not detected in the samples analyzed.

Concrete was identified as part of the system of the Flocculation Basin. Two (2) samples of this material were obtained. Asbestos was not detected in the samples analyzed.

Concrete was identified as the foundation pad under the Rapid Mix Tank. Two (2) samples of this material were obtained. Asbestos was not detected in the samples analyzed.

Concrete block was identified as the walls of the Head House. Two (2) samples of this material were obtained. Asbestos was not detected in the samples analyzed.

Concrete was identified as the walls and floor of the Polishing Pond Pump House. Two (2) samples of this material were obtained. Asbestos was not detected in the samples analyzed.

Concrete was identified as the primary component of the Acid Injection Basin. Two (2) samples of this material were obtained. Asbestos was not detected in the samples analyzed.

Concrete was identified as the walls and floor of the Vault. Two (2) samples of this material were obtained. Asbestos was not detected in the samples analyzed.

Fire Doors

Fire doors were not identified in the structures on the Site.

Joint Compound

Joint compound was not identified on the wall systems in the structures on the Site.

Leveling Compound

Leveling compound was not identified in the structures on the Site.

Mastics

An expansion joint mastic was identified on the Polishing pond. Two (2) samples of this material were obtained. Asbestos was not detected in the mastic.

Expansion joints with mastics and/or sealing compounds were not identified on the remaining concrete structures (Flocculation Basin, Acid Injection Basin, or Vault).

Mastics were not identified in the remaining buildings covered in this survey.

Plaster/Scratch Coat/Finish Coat

Plaster was not identified on the walls of the structures on the Site.

Stucco/Scratch Coat/Finish Coat

Stucco was not identified on the wall systems in the structures on the Site.

Wallboard

Gypsum Wallboard (drywall) was not identified in the structures on the Site.

Wallboard Tape

Wallboard tape was not identified in the structures on the Site.

Vapor Barrier

A vapor barrier was not identified in the structures on the Site.

5.4 INACCESSIBLE AND UNSAMPLED SUSPECT ACM

It should be noted that certain suspect materials may not have been sampled. Unsuspected suspect ACM may be located within pipes, walls, ceiling cavities and other non-accessible areas. Caution should be used in relation to any unidentified materials encountered until proper sampling and analysis have determined the asbestos content.

Metal piping with numerous gaskets were observed at the Aeration Basin, Flocculation Basin, Lime Pipe & Rack, Head House, Polishing Pond Pump House, Acid Injection Basin, Polishing Pond Outfall, Outfall House, and Vault. Operations at the plant on the date of our survey made it impossible to obtain samples of the multiple seals and gaskets in the pipelines at the Site. These materials should be considered ACM until operations permit the testing of them.

5.5 PRIOR REPORTS

GEOTEK was not supplied with prior reports for the subject Site. The survey was limited to specific building and structures identified in a provided Civil CTP Demolition Plan (included in Appendix A).

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the analytical results of the ACM survey, asbestos-containing materials were not identified in the structures at the Site. However, operations at the plant on the date of our survey made it impossible to obtain samples of the multiple seals and gaskets in the pipelines at the Site. These materials should be considered ACM until operations permit the testing of them.

If additional materials not described in this report are discovered during demolition, or if the scope of renovations changes to impact other systems not surveyed as part of this limited ACM survey, they should be assumed to contain asbestos until proven otherwise.

7.0 LIMITATIONS

7.1 SPECIAL TERMS AND CONDITIONS

GEOTEK conducted an ACM Survey in substantial accordance with AHERA as authorized by AMEC FOSTER WHEELER. This study does not include sampling of soil, groundwater and/or the debris on-Site for environmental testing. This report is intended for the use of AMEC FOSTER WHEELER and their immediate assignees. The contents should not be relied upon by any party other than the aforementioned without the express written consent of GEOTEK. This survey alone is not to be used for abatement purposes.

7.2 LIMITATIONS AND EXCEPTIONS OF ASSESSMENT

The findings, conclusions, and recommendations made in this report are based on the information that was made available to GEOTEK, in most instances from public records. The information is relevant to the date of our site work and should not be relied on to represent conditions at any later date. The opinions and conclusions expressed herein are based on information obtained during our assessment and on our experience and current standards of technical practice. GEOTEK makes no other warranties, either express or implied, concerning the completeness of the data furnished to us. GEOTEK cannot be responsible for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed at the time our assessment was undertaken. GEOTEK is not responsible, nor liable for work, testing or recommendations performed or provided by others. This report is not and should not be construed as a warranty or guarantee about the presence or absence of additional environmental hazards or contaminants, which may affect the subject Site. Facts, conditions, and acceptable risk factors change with time; accordingly, this report should be viewed within this context.

8.0 CERTIFICATIONS

GEO TEK, INC. (GEO TEK) has performed an Asbestos-Containing Materials Survey of the Bunker Hill Central Treatment Plant located in the City of Kellogg, Shoshone County, Idaho (the "Site").

The project team qualifications are included in Appendix C.

We appreciate this opportunity to be of service. If you have any questions, or if we can be of further service, please contact us at (702) 897-1424.

Sincerely,
GEO TEK, INC.

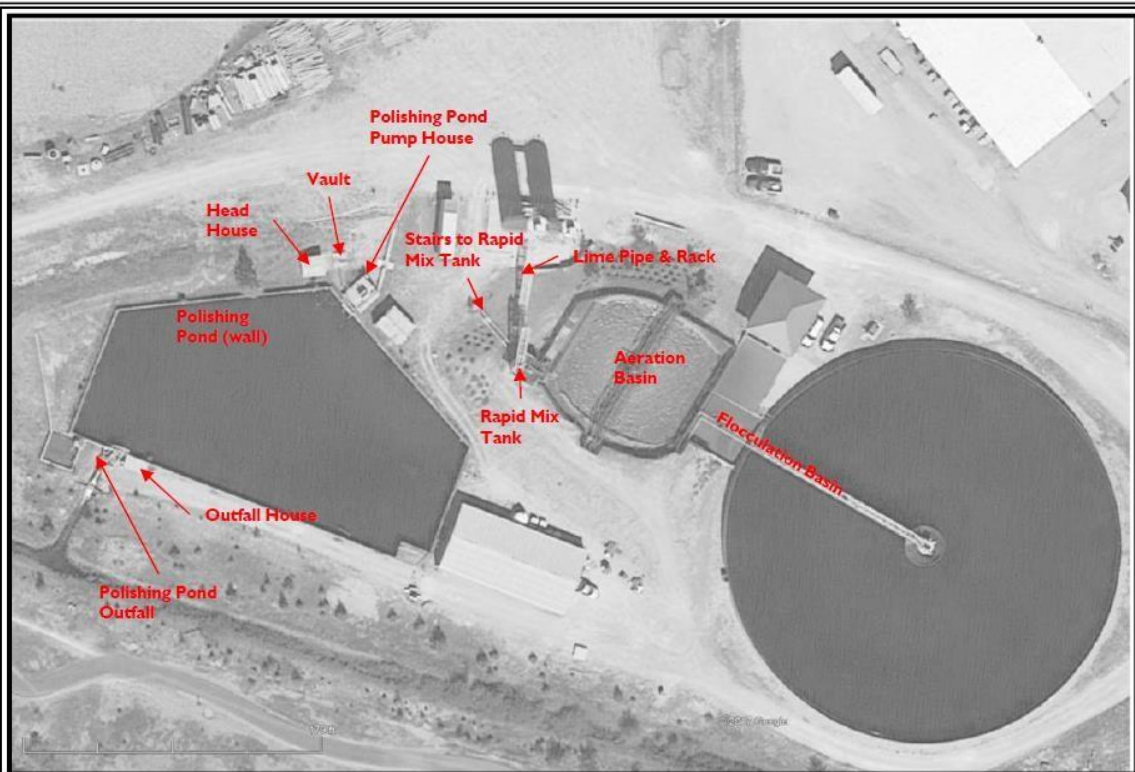


J. Michael Batten, CAC, LAAC
Environmental Services Manager
Accredited Building Inspector (EPA)
Certified Asbestos Consultant (California)
Licensed Asbestos Abatement Consultant (Nevada)

1484-ID2-ACM-AMEC Foster Wheeler-Bunker Hill CTP-JMB-012318-Revised

APPENDIX A

FIGURES



Source: Google Earth, August 2014
 Scale: Not given



GEOTECHNICAL | ENVIRONMENTAL | MATERIALS

7950 N. Meadowlark Way, Suite E, Coeur d'Alene, ID 83815
 (208) 904-2980 (phone) / (208) 904-2981 (FAX)

FIGURE I **SITE LAYOUT MAP**

BUNKER HILL CENTRAL TREATMENT PLANT
KELLOGG, IDAHO
 Prepared for: **AMEC FOSTER WHEELER**

Project No.:

1484-ID2-ACM

Report Date:

01/02/18

Drawn By:

JMB

AMEC FOSTER WHEELER
BUNKER HILL CENTRAL TREATMENT PLANT
GEOTEK PROJECT NO. 1484-ID2

JANUARY 2, 2018
APPENDIX B

APPENDIX B

LABORATORY REPORT



EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report

0195827

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client: GEO-TEK, INC. Job# / P.O. #:
Address: 6835 S. ESCONDIDO ST, STE A Date Received: 12/21/2017
LAS VEGAS, NV 89119 Date Analyzed: 12/28/2017
Collected: 12/19/2017 Date Reported: 12/28/2017
Project Name: BUNKER HILL CTP EPA Method: EPA 600/R-93/116
Address: Submitted By: J. MICHAEL BATTEN
Collected By:

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0195827-001 1484-01	POLISHING PANEL	Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Mica Carbonates Binder/Filler 99%
0195827-002 1484-02	POLISHING PANEL	Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Mica Carbonates Binder/Filler 99%
0195827-003 1484-03	POLISHING PANEL	Expansion Joint, Black	No	None Detected	Cellulose Fiber 30% Synthetic Fiber 5% Carbonates Binder/Filler 65%
0195827-004 1484-04	POLISHING PANEL	Expansion Joint, Black	No	None Detected	Cellulose Fiber 30% Synthetic Fiber 5% Carbonates Binder/Filler 65%
0195827-005 1484-05	FLOCCULATION	Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Mica Carbonates Binder/Filler 99%
0195827-006 1484-06	FLOCCULATION	Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Mica Carbonates Binder/Filler 99%

EMC LABS, INC.9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report

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Project Name: BUNKER HILL CTP EPA Method: EPA 600/R-93/116
Address: Submitted By: J. MICHAEL BATTEN
Collected By:

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0195827-007 1484-07		Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Mica Carbonates Binder/Filler 99%
0195827-008 1484-08		Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Mica Carbonates Binder/Filler 99%
0195827-009 1484-09	HEAD HOUSE	Concrete, Gray	No	None Detected	Gypsum Quartz Perlite Carbonates Binder/Filler 100%
0195827-010 1484-10	HEAD HOUSE	Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Perlite Carbonates Binder/Filler 99%
0195827-011 1484-11	PUMP HOUSE	Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Perlite Carbonates Binder/Filler 99%

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report

0195827

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client: GEO-TEK, INC. Job# / P.O. #:
Address: 6835 S. ESCONDIDO ST, STE A Date Received: 12/21/2017
LAS VEGAS, NV 89119 Date Analyzed: 12/28/2017
Collected: 12/19/2017 Date Reported: 12/28/2017
Project Name: BUNKER HILL CTP EPA Method: EPA 600/R-93/116
Address: Submitted By: J. MICHAEL BATTEN
Collected By:

Lab ID Client ID	Sample Location	Layer Name / Sample Description	Asbestos Detected	Asbestos Type (%)	Non-Asbestos Constituents
0195827-012 1484-12	PUMP HOUSE	Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Perlite Carbonates Binder/Filler 99%
0195827-013 1484-13	PUMP HOUSE	Roof Shingle, White/Gray/Black	No	None Detected	Cellulose Fiber 15% Quartz Carbonates Binder/Filler 85%
0195827-014 1484-14	PUMP HOUSE	Roof Shingle, White/Gray/Black	No	None Detected	Cellulose Fiber 20% Quartz Carbonates Binder/Filler 80%
0195827-015 1484-15	VAULT	Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Mica Carbonates Binder/Filler 99%
0195827-016 1484-16	VAULT	Concrete, Gray	No	None Detected	Cellulose Fiber <1% Gypsum Quartz Mica Carbonates Binder/Filler 99%

EMC LABS, INC.

9830 S. 51st Street, Suite B109, Phoenix, AZ 85044
Phone: 800-362-3373 or 480-940-5294 - Fax: (480) 893-1726

Laboratory Report
0195827

Bulk Asbestos Analysis by Polarized Light Microscopy

NVLAP#101926-0

Client: GEO-TEK, INC. Job# / P.O. #:
Address: 6835 S. ESCONDIDO ST, STE A Date Received: 12/21/2017
LAS VEGAS, NV 89119 Date Analyzed: 12/28/2017
Collected: 12/19/2017 Date Reported: 12/28/2017
Project Name: BUNKER HILL CTP EPA Method: EPA 600/R-93/116
Address: Submitted By: J. MICHAEL BATTEN
Collected By:

Lab ID	Sample	Layer Name /	Asbestos	Asbestos Type	Non-Asbestos
Client ID	Location	Sample Description	Detected	(%)	Constituents


Analyst - Johann Hofer


Signatory - Lab Director - Kurt Kettler

Distinctly stratified, easily separable layers of samples are analyzed as subsamples of the whole and are reported separately for each discernible layer. All analyses are derived from calibrated visual estimate and measured in area percent unless otherwise noted. The report applies to the standards or procedures identified and to the sample(s) tested. The test results are not necessarily indicated or representative of the qualities of the lot from which the sample was taken or of apparently identical or similar products, nor do they represent an ongoing quality assurance program unless so noted. These reports are for the exclusive use of the addressed client and that they will not be reproduced wholly or in part for advertising or other purposes over our signature or in connection with our name without special written permission. The report shall not be reproduced except in full, without written approval by our laboratory. The samples not destroyed in testing are retained a maximum of thirty days. The laboratory measurement of uncertainty for the test method is approximately less than 1 by area percent. Accredited by the National Institute of Standards and Technology, Voluntary Laboratory Accreditation Program for selected test method for asbestos. The accreditation or any reports generated by this laboratory in no way constitutes or implies product certification, approval, or endorsement by the National Institute of Standards and Technology. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. Polarized Light Microscopy may not be consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials.

CHAIN OF CUSTODY

EMC Labs, Inc.
9830 S. 51st St., Ste B-109
Phoenix, AZ 85044
(800) 362-3373 Fax (480) 893-1726

LAB#: 195827
TAT: 3 days
Rec'd: DEC 21 P.M.

COMPANY NAME: **GEOTEK, INC**

BILL TO: (If Different Location)

6835 S. Escondido St, Ste A

Las Vegas, NV 89119

CONTACT:

J. Michael Batten

Phone/Fax:

(702) 897-1424 / (702) 897-2213

Email:

mbatten@geotekusa.com & jsmith@geotekusa.com

Now Accepting: **VISA - MASTERCARD**

Price Quoted: \$ ____ / Sample \$ ____ / Layers

COMPLETE ITEMS 1-4: (Failure to complete any items may cause a delay in processing or analyzing your samples)**1. TURNAROUND TIME:** [Same Day RUSH] [1-Day] [2-Day] [3-Day] [5-Day] [6-10 Day]****Prior confirmation of turnaround time is required

****Additional charges for rush analysis (please call marketing department for pricing details)

****Laboratory analysis may be subject to delay if credit terms are not met

2. TYPE OF ANALYSIS: [Bulk-PLM] [Air-PCM] [Lead] [Point Count] [Fungi: AOC, W-C, Bulk, Swab, Tape]**3. DISPOSAL INSTRUCTIONS:** [Dispose of samples at EMC] / [Return samples to me at my expense]

(If you do not indicate preference, EMC will dispose of samples 30 days from analysis.)

4. Project Name:

Bunker Hill CTP

P.O. Number:

Project Number:

EMC SAMPLE #	CLIENT SAMPLE #	DATE & TIME SAMPLED	LOCATION/MATERIAL TYPE	Samples Accepted Yes / No	AIR SAMPLE INFO / COMMENTS		
					ON	OFF	FLOW RATE
1	1484-01	12/19/17		Y N			
				Y N			
				Y N			
				Y N			
				Y N			
16	1484-16			Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			

SPECIAL INSTRUCTIONS:

Sample Collector: (Print)

(Signature)

Relinquished by:

Date/Time:

Received by:

Date/Time:

Relinquished by: Diana FedericoDate/Time: 12/21/17Received by: Don J. D. AllenDate/Time: 12-21-17

Relinquished by:

Date/Time:


Received by:

Date/Time:

** In the event of any dispute between the above parties for these services or otherwise, parties agree that jurisdiction and venue will be in Phoenix, Arizona and prevailing party will be entitled to attorney's fees and court costs.

ACM BULK SAMPLE LOG/CHAIN OF CUSTODY


Page 1 of 2

 GEOTEK, INC. 6835 South Escondido Street, Suite A Las Vegas, NV 89119 Phone: (702) 897-1424 FAX: (702) 897-2213		Project No.: 1484-ID2 Project Name: Bunker Hill CTP Project Manager: J. Michael Batten Sampled By: <i>[Signature]</i> Date: 12/19/17			LABORATORY INSTRUCTIONS *PLM *Standard T/A 195827			
Sample No.	Material	Location	Condition	Area (sf/lf)	Potential For:			Comments
1484-01	Concrete	Polishing Pond	G		Con	Vib	Air	
1484-02	?	?	?					
1484-03	Expansion Joint	Polishing Pond	G					
1484-04	?	?	?					
1484-05	Concrete	Recirculation	G					
1484-06	?	?	?					
1484-07	Concrete	Regret Main Tank	G					
1484-08	?	?	?					
1484-09	Concrete Block	Head House	G					
1484-10	?	?	?					
1484-11	Concrete	Pump House	G					
1484-12	?	?	?					
CHAIN OF CUSTODY								
Relinquished by: <i>J. Michael Batten</i>			Company: GEOTEK, INC.		Date: 12/20/17		Time: 1200	
Received by: <i>Diana Federico</i>			EMC Labs		Date: 12/21/17		Time: 1040	
Relinquished by: <i>Diana Federico</i>			EMC Labs		Date: 12/21/17		Time: 0820	
Received by: <i>John - JDHefner</i>			EMC Labs		Date: 12-21-17		Time: 1320	

GEOTECHNICAL | ENVIRONMENTAL | MATERIALS

ACM BULK SAMPLE LOG/CHAIN OF CUSTODY

Page 2 of 2

	GEOTEK, INC. 6835 South Escondido Street, Suite A Las Vegas, NV 89119 Phone: (702) 897-1424 FAX: (702) 897-2213	Project No.: 1484-ID2 Project Name: Bunker Hill CTP Project Manager: J. Michael Batten Sampled By: <i>[Signature]</i> Date: 12/19/17	LABORATORY INSTRUCTIONS *PLM *Standard T/A <i>(95827)</i>
---	--	--	--

Sample No.	Material	Location	Condition	Area (sf/lf)	Potential For:			Comments
1484-13	Reef	Ramp House	G		Con	Vib	Air	
1484-14	?	?	?					
1484-15	Concrete	Vault	G					
1484-16	?	?	?					

CHAIN OF CUSTODY			
Relinquished by: <i>J. Michael Batten</i>	Company: GEOTEK, INC.	Date: 12/20/17	Time: 1200
Received by: <i>Diana Federico</i>	EMC Labs	12/21/17	1040
Relinquished by: <i>Diana Federico</i>	EMC Labs	12/21/17	1320
Received by: <i>Sam JDHofen</i>	EMC Labs	12-21-17	1320

Bulk Asbestos Analysis

(EPA Method 600/M4-82-020 and 600/R-93-116, Visual Area Estimation)

GeoTek, Inc.
Michael Batten
6835 S. Escondido Street
Suite A
Las Vegas, NV 89119

Client ID: L1357
Report Number: B252541
Date Received: 01/19/18
Date Analyzed: 01/22/18
Date Printed: 01/22/18
First Reported: 01/22/18

Job ID/Site: 1484-ID2, Bunker Hill CTP

FALI Job ID: L1357

Date(s) Collected: 01/18/2018

Total Samples Submitted: 2

Total Samples Analyzed: 2

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
011818-01	01176026						
Layer: Grey Cementitious Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
011818-02	01176027						
Layer: Grey Cementitious Material			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							




Ryan Sutcliffe, Laboratory Analyst, Las Vegas Laboratory

Note: Limit of Quantification ('LOQ') = 1%. 'Trace' denotes the presence of asbestos below the LOQ. 'ND' = 'None Detected'.

Analytical results and reports are generated by Forensic Analytical Laboratories Inc. (FALI) at the request of and for the exclusive use of the person or entity (client) named on such report. Results, reports or copies of same will not be released by FALI to any third party without prior written request from client. This report applies only to the sample(s) tested. Supporting laboratory documentation is available upon request. This report must not be reproduced except in full, unless approved by FALI. The client is solely responsible for the use and interpretation of test results and reports requested from FALI. Forensic Analytical Laboratories Inc. is not able to assess the degree of hazard resulting from materials analyzed. FALI reserves the right to dispose of all samples after a period of thirty (30) days, according to all state and federal guidelines, unless otherwise specified. All samples were received in acceptable condition unless otherwise noted.

ACM BULK SAMPLE LOG/CHAIN OF CUSTODY

Page 1 of 1

	GEOTEK, INC.	Project No.: 1484-ID2	LABORATORY INSTRUCTIONS *PLM *24-Hour T/A
	6835 South Escondido Street, Suite A	Project Name: Bunker Hill CTP	
	Las Vegas, NV 89119	Project Manager: J. Michael Batten	
	Phone: (702) 897-1424	Sampled By: _____	
	FAX: (702) 897-2213	Date: 01/18/18	

Sample No.	Material	Location	Condition	Area (sf/lf)	Potential For:			Comments
01/18/18-01	Concrete	Acid Injection	G		Con	Vib	Air	
01/18/18-02	Concrete	2	2					

CHAIN OF CUSTODY			
Relinquished by: <i>J. Michael Batten</i>	Company: GEOTEK, INC.	Date: 1/19/18	Time: 10:50
Received by: <i>J. Harrison</i>	FALZ	1/19/18	10:52
Relinquished by:			
Received by:			



GeoTek, Inc.

7950 N.Meadowlark Way Suite E Coeur d'Alene, ID 83815
(208) 904-2980 Office (208) 904-2981 Fax www.geotekusa.com

**HAZARDOUS MATERIALS
SURVEY**

**BUNKER HILL CENTRAL TREATMENT PLANT
KELLOGG, IDAHO**

January 23, 2018

GEOtek Project No. 1484-ID2

Prepared For:

AMEC FOSTER WHEELER

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LIST OF APPENDICES

- APPENDIX A: FIGURES
APPENDIX B: PROJECT TEAM QUALIFICATIONS

I.0 EXECUTIVE SUMMARY

GEOTEK, INC. (GEOTEK) has performed a Hazardous Materials Survey at the Bunker Hill Central Treatment Plant in the City of Kellogg, Shoshone County, Idaho (the "Site"). Our services were conducted in substantial conformance with the scope and limitations of the American Society of Testing and Materials (ASTM) E 1527-13, "*Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*". Any additions or deletions from our scope of services are discussed in the appropriate sections of this assessment.

Hazardous materials were not identified in or on the specific buildings and structures at the Site.

This executive summary does not contain all the information that is found in the full report. The report should be read in its entirety to obtain a more complete understanding of the information provided, and to aid in any decisions made or actions taken based on this information.

2.0 INTRODUCTION

On December 19, 2017, GEOTEK, INC. (GEOTEK) conducted a Hazardous Materials (HAZMAT) survey at the Bunker Hill Central Treatment Plant in the City of Kellogg, Shoshone County, Idaho, hereinafter referred to as the "Site" (see Figure 1 in Appendix A).

2.1 PURPOSE

The purpose of the survey was to identify and locate, hazardous or potentially hazardous materials and/or wastes used or stored at the Site, or equipment which may contain hazardous materials. The survey was limited to specific building and structures identified in a provided Civil CTP Demolition Plan (included in Appendix A). The survey was performed by Mr. J. Michael Batten, a Registered Environmental Property Assessor and Certified Environmental Manager.

2.2 THIRD PARTY RELIANCE

Third party reliance letters may be issued upon request and upon the payment of the, then current, fee for such letters. All third parties relying on GEOTEK's reports, by such reliance, agree to be bound by GEOTEK's General Conditions and limitations. No reliance by any party is permitted without such agreement, regardless of the content of the reliance letter itself.

3.0 DESCRIPTION OF FACILITY

The Site is occupied by Bunker Hill Central Treatment Plant, located in the City of Kellogg, Shoshone County, Idaho. The survey was limited to specific building and structures identified in a provided Civil CTP Demolition Plan (included in Appendix A).

The Polishing Pond wall scheduled for demolition was of concrete construction with expansion joints.

The Aeration Basin was an earthen structure with a metal catwalk and metal piping.

The Flocculation Basin is a metal containment with a metal catwalk and a concrete structure with pumps and metal piping.

The Rapid Mix Tank was a metal structure with metal piping.

The Lime Pipe and Rack is a metal piping structure.

The Head House is a concrete block building with a metal roof. It also contains metal piping.

The Polishing Pond Pump House is a concrete building with an asphaltic roof. It also contains metal piping.

The Acid Injection basin is a concrete basin with metal piping.

The Polishing Pond Outfall is a metal pipe and catwalk structure.

The Outfall House is a wood and metal structure with metal piping.

The Block Wall & Stairs is scheduled to be dis-assembled, with the blocks remaining intact. Therefore, the blocks were not sampled for this survey.

The Stairs to the Rapid Mix Tank are a metal structure.

The Vault is a concrete structure with metal piping.

4.0 FINDINGS

Based on our visual survey, hazardous materials and/or wastes were not identified in or on the structures on the Site. A figure identifying the structures is included in Appendix A.

4.1 HAZARDOUS SUBSTANCES

GEOTEK did not observe hazardous materials or wastes on the Site. No suspect or unidentified containers were observed. No stains or discolored soil was observed. No pungent or acrid odors were observed emanating from the Site.

4.2 POLY-CHLORINATED BIPHENYLS (PCBS)

GEOTEK did not observe suspect equipment (light fixtures, transformers, elevators, vehicle lifts, trash compactors, etc.), which may contain PCBs on the Site.

4.3 MERCURY VAPOR LAMPS

GEOTEK did not observe mercury vapor lamps in the structures on the Site.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our survey, hazardous materials were not identified in or on the specific buildings and structures at the Site.

If additional materials not described in this report are discovered during demolition, or if the scope of renovations changes to impact other systems not surveyed as part of this survey, they should be assumed to be hazardous until proven otherwise.

6.0 LIMITATIONS

6.1 SPECIAL TERMS AND CONDITIONS

GEOTEK conducted a hazardous materials Survey in substantial accordance with ASTM as authorized by AMEC FOSTER WHEELER. This study does not include sampling of soil, groundwater and/or the debris on-Site for environmental testing. This report is intended for the use of AMEC FOSTER WHEELER and their immediate assignees. The contents should not be relied upon by any party other than the aforementioned without the express written consent of GEOTEK. This survey alone is not to be used for abatement purposes.

6.2 LIMITATIONS AND EXCEPTIONS OF ASSESSMENT

The findings, conclusions, and recommendations made in this report are based on the information that was made available to GEOTEK. The information is relevant to the date of our site work and should not be relied on to represent conditions at any later date. The opinions and conclusions expressed herein are based on information obtained during our assessment and on our experience and current standards of technical practice. GEOTEK makes no other warranties, either express or implied, concerning the completeness of the data furnished to us. GEOTEK cannot be responsible for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed at the time our assessment was undertaken. GEOTEK is not responsible, nor liable for work, testing or recommendations performed or provided by others. This report is not and should not be construed as a warranty or guarantee about the presence or absence of additional environmental hazards or contaminants, which may affect the subject Site. Facts, conditions, and acceptable risk factors change with time; accordingly, this report should be viewed within this context.

7.0 CERTIFICATIONS

GEOTEK, INC. (GEOTEK) has performed an Asbestos-Containing Materials Survey of the Bunker Hill Central Treatment Plant located in the City of Kellogg, Shoshone County, Idaho (the "Site").

The project team qualifications are included in Appendix B.

We appreciate this opportunity to be of service. If you have any questions, or if we can be of further service, please contact us at (702) 897-1424.

Sincerely,
GEOTEK, INC.

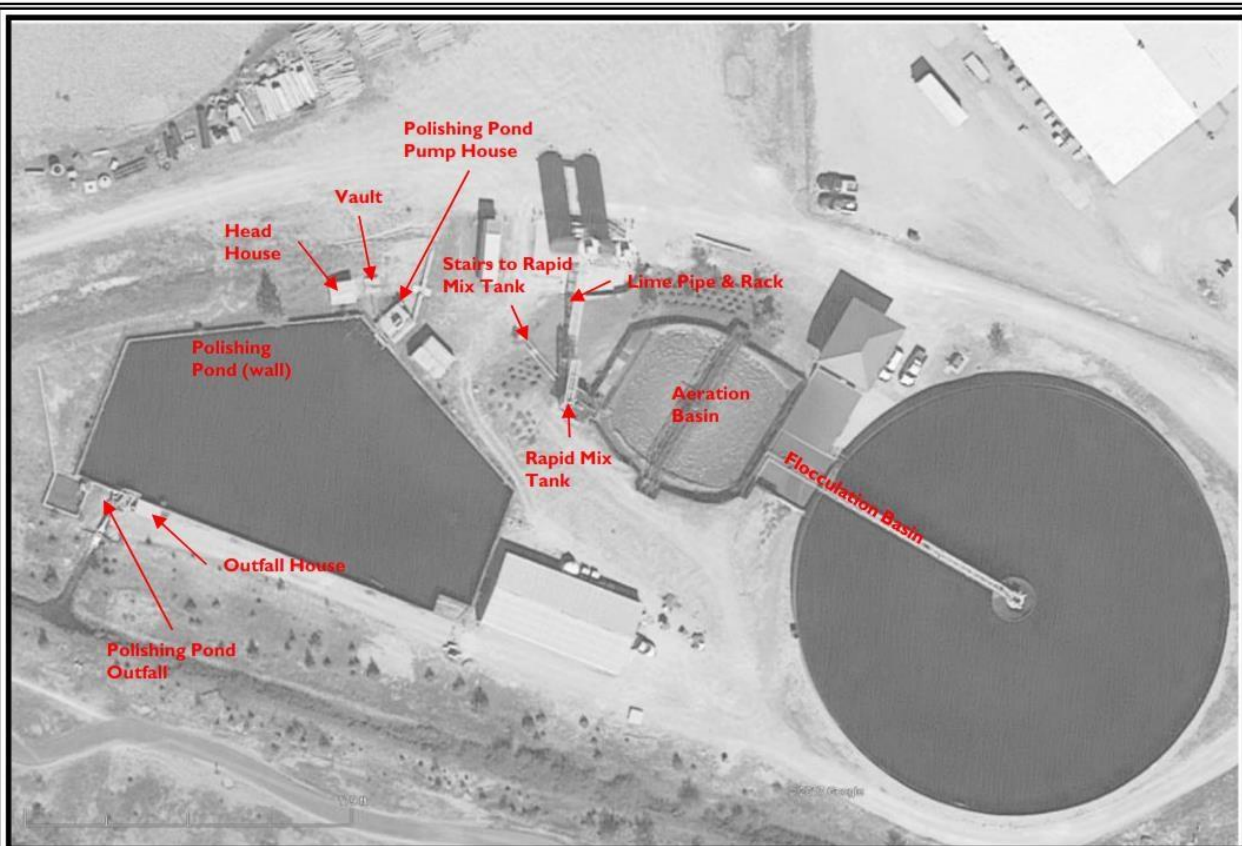


J. Michael Batten, REPA, CEM
Environmental Services Manager
Registered Environmental Property Assessor No. 113162
Expires 06/15/2018

I484-ID2-HAZ-AMEC Foster Wheeler-Bunker Hill CTP-JMB-012318-Revised

APPENDIX A

FIGURES



Source: Google Earth, August 2014
Scale: Not given



GEOTEK

GEOTECHNICAL | ENVIRONMENTAL | MATERIALS

7950 N. Meadowlark Way, Suite E, Coeur d'Alene, ID 83815
(208) 904-2980 (phone) / (208) 904-2981 (FAX)

FIGURE I SITE LAYOUT MAP

BUNKER HILL CENTRAL TREATMENT PLANT
KELLOGG, IDAHO

Prepared for: AMEC FOSTER WHEELER

Project No.:

1484-ID2-HAZ

Report Date:

01/05/18

Drawn By:

JMB

APPENDIX B

PROJECT TEAM QUALIFICATIONS



J. MICHAEL BATTEN, CAC, CEM, REPA

Environmental Services Manager

Education

BS in Geology, California State University, Fresno 1988

Registrations

- Certified Asbestos Consultant (CA #95-1721)
- Licensed Asbestos Abatement Consultant (NV #IJPM0655)
- Certified Environmental Manager (NV #1782)
- Asbestos Professional Inspector (IL #100-11092)
- Registered Environmental Property Assessor (#113162))
- Certified Lead Inspector Assessor (CA #4358)
- Certified Lead Inspector (EPA #LBP-I-1162326-1)
- Certified Lead Risk Assessor (EPA #LBP-R-1162326-1)

Certifications

- AHERA Certified Asbestos Building Inspector, Management Planner, Project Designer, & Contractor/Supervisor
- EPA Accredited Lead-based Paint Inspector & Risk Assessor
- OSHA HAZWOPER certified worker & supervisor
- OSHA Construction Safety & Health (10-Hour)

Affiliations

- American Society of Testing and Materials
- National Registry of Environmental Professionals

Professional Experience

Mr. Batten has over 26 years of environmental experience, throughout which he has conducted and managed numerous environmental investigations, assessments, and remediations. He has prepared several NEPA assessments, USEPA EIS, and CEQA EIR reports. In addition, Mr. Batten has extensive experience in conducting asbestos and lead-based paint surveys and preparing management plans, including remediation design, for asbestos and lead present in buildings.

Project Experience

- **Phase I Environmental Site Assessments:** Mr. Batten has conducted more than 2,000 Phase I Environmental Site Assessments in 21 states, including Brownfield studies under USEPA grants.
- **Phase II Environmental Site Assessments:** Mr. Batten has conducted more than 150 Phase II Environmental Assessments, including Brownfield studies under USEPA grants.
- **Site Characterizations and Remediations:** Mr. Batten has experience conducting numerous site characterizations and remediations, including obtaining regulatory closure.
- **NEPA Studies:** Mr. Batten has conducted more than 200 NEPA studies, including Environmental Assessments, Environmental Impact Reports/Environmental Impact Studies, in eight states. The agencies involved include USEPA, FCC, BLM, National Park Service, and California EPA.
- **Asbestos Services:** Mr. Batten has conducted over 600 asbestos surveys in several states. He has also prepared numerous Asbestos Management Plans, prepared design plans, and monitored numerous abatement projects.
- **Lead-Based Paint Services:** Mr. Batten has conducted numerous Lead-Based Paint surveys.
- **Landfills:** Mr. Batten has conducted investigations and overseen remediations on landfills in Fresno, California and Henderson, Nevada.
- **Other Services:** Mr. Batten has been called upon to conduct less usual services on occasion, including mold consultation and investigation, radon studies, vapor intrusion studies, and indoor air quality studies.

APPENDIX B

Construction and Demolition Diversion/Disposal Transaction Report

Construction and Demolition Diversion/Disposal Transaction Report

Project Name	Bunker Hill Central Treatment Plant Upgrade and Groundwater Collection System	
Site Location	Kellogg, Idaho	
Contract Number (Subcontractor Used)		
Task Order (Subcontractor Used)		
Material	Tonnage	Destinations
Asphalt/Brick/Concrete		
Metal		
Other Recyclables		
Specialty Materials		
Wood		
Disposal – On-site (SPA)		
Disposal – Off-site		

- Metal includes: Aluminum, Copper, Mixed Metal, Steel, and Other C&D Metal.
- Other Recyclables: all diverted source separated or commingled recyclables that are not included in other recycling categories.
- Specialty Materials: Ceiling Tile, Composition Roof, Doors, Windows, Stairs, Cabinets, Glass, Gypsum/Plaster, Insulation, Paper, Plastic, and Siding.
- Wood: Finished, Structural, Treated, and Other C&D Wood.
- Disposal: All materials disposed on-site or off-site.

Contracting Officer's Representative: _____ Date _____